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USSR Report

ENERGY

(FOUO 13/82)



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ELECTRIC POWER

POWER AND ELECTRIFICATION MINISTER ON 11TH FIVE-YEAR PLAN

Moscow ENERGETICHESKOYE STROITEL'STVO in Russian No 11, Nov 81pp 3-5

/Article by P. S. Neporozhnyy, USSR Minister of Power and Electrification and corresponding member of the USSR Academy of Sciences: "The USSR's Power Industry in the Forthcoming Five-Year Period"

/Text The historical 26th Party Congress tallied the results of the 10th Five-Year Plan and determined the targets of the party and government for raising the well-being of the Soviet people and developing the national economy.

The rapid growth of production forces and the solution of the tasks for the social and economic development of the Soviet Union would not be possible without the deepening and expansion of electrification, which is based upon the rapid growth of the electric power industry as a sector of the national economy.

During the past 15 years the development of the national economy has required an increase in the production of electric power amounting to 150 percent. During this same time frame the installed rated capacity of electric power stations has increased 130 percent, amounting to nearly 267 million kW. In 1980 the USSR generated 1,294 billion kW-hours of electricity altogether: 1,038 billion kW-hours at thermal electric power stations, 183 billion kW-hours at hydroelectric power stations, atomic power stations accounted for 73 billion kW-hours. The installed rated capacity of TES's in 1980 was 201.9, GES's was 52.3, and AES's was 12.5 million kW.

In 1980 there were 72 power stations with an individual rated capacity greater than one million kW in operation in the Soviet Union; this included 32 power stations with a rated capacity greater than two million kW each. The total length of high-voltage power transmission lines today is more than four million kilometers, including 768,000 kilometers of power lines with a voltage of 35 kV and higher.

In the past five-year plan the Kurskaya AES and the Chernobyl'skaya AES were put into operation; they have RBMK-1000 reactors. Also put into operation was a VVER-1000 power unit at the Novovoronezhskaya

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AES, the first fast breeder BN-600 reactor at the Beloyarskaya AES, power units with VVER-440 reactors at the Kol'skaya AES, and the Armysanskaya and Rovenskaya AES's. It is necessary to emphasize that the accomplishment of this extensive program of construction of atomic power stations was one of the most significant achievements of the 10th Five-Year Plan: while at the start of the five-year plan the total rated capacity of then existing atomic power stations was only 4.9 million kW, by the final year of the five-year plan there were in operation ten power stations with a total rated capacity in excess of 12 million kW and construction was underway on 11 more AES's with a total planned capacity of 50 million kW.

Gas and fuel oil power units with a total rated capacity of 800 MW each were put into operation at the Zaporozhskaya, Uglegorskaya and Ryazanskaya GRES's; coal-dust power units with a rated capacity of 500 MW each were started up at the Troitskaya and Reftinskaya GRES's; and the first 500 MW power units were put into operation at the Ekibastuzskaya GRES-1. The latter power station is the first station of the Ekibastuz fuel and power complex. A unique 1,200 MW power unit was put into operation at the Kostromskaya GRES.

In the 10th Five-Year Plan the series production of central heating turbines with a per-unit rated capacity of 250 MW was assimilated, as was the series production plant manufactured gas and fuel oil TETs's - the TETs-ZIGM. The first central heating unit with a T-175/210-130 turbine was put into operation; this unit is designed to use low-grade solid fuel. A plant manufactured TETs designed to burn solid fuel - a TETs - ZITT - was developed as a section with a T-180/210-130 turbine (with the intermediate reheating of steam) and a boiler with a steam generating capacity of 670 tons per hour. The first such power units are to be put into operation during the 11th Five-Year Plan at the Gomel'skaya and Khabarovskaya TETs's.

The first hydrounits with a rated capacity of 640 MW each have started generating electricity at the Sayano-Shushenskaya GES, the largest in the world. Similar units are producing power at the Ingurskaya GES, and the Nizhnekamskaya and Cheboksarskaya GES's. The final units have been put into operation at the Nurekskaya, Ust'Ilimskaya and Zeyskaya GES's.

Put into operation were 750 kV LEP's: the substation for the LEP between the West Ukrainian and Al'bentirsha (Hungary), Leningrad and Moscow, the Chernobyl'skaya AES and the West Ukrainian substation, the Kurskaya AES and the Novobryanskaya substation. Also put into operation were 500 kV LEP's: Tselinograd - Yesil'-Sarbay, Toktogul - Frunze, Novovoronezhskaya AES - Donbasskaya substation, and others. Construction was started on unique power transmission lines with a voltage of 1,500 kW and a direct current and 1,150 kW and an alternating current from the future Ekibastuzskaya GRES's to the central portion of the Soviet Union and to the Urals.

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A significant increase in the scale and the switch to qualitatively new ways of developing the electric power industry in recent years has provided the power industry workers with complicated tasks, which for the most part they have managed to handle. At the same time we cannot close our eyes to the serious shortcomings that we have experienced in recent years. Of the planned introduction of capacities in the 10th Five-Year Plan, which amounted to 61 million kW, a total of seven million kW of capacity was not put into operation.

In spite of the fact that the pace of constructing atomic electric power stations was better than 200 percent of what it had been in the 9th Five-Year Plan, the pace was inadequate in present-day conditions: the state plan assignment for the start-up of capacities at atomic power stations was fulfilled by the USSR Ministry of Power and Electrification by only 65 percent in the 10th Five-Year Plan.

There were several reasons for this. As we all know, in the previous years the basic efforts of the designers and builders were directed chiefly at improving the construction of thermal electric power stations. As a result, the USSR Ministry of Power and Electrification was not prepared to undertake an extensive AES construction program in the 9th and 10th five-year plans; this was caused by the lack of an adequate number of skilled construction workers who were familiar with atomic power station construction and the shortage of specialized machinery and equipment, industrial and the repeated use of concrete forms. Disruptions in the time periods and completeness of deliveries of equipment by several ministry-level suppliers had a negative effect on the timely start-up of AES's, etc. Ultimately, this resulted in the non-fulfillment of the five-year plan for the introduction of AES's.

Another problem was the underutilization of the installed rated capacity of units for thermal electric power stations due to unfinished construction work, the under delivery of fuel and a worsening of the quality of the fuel.

In the construction of the electric power network nearly 27,000 kilometers of power transmission lines were not put into operation; this amounted to nearly 15 percent of the power network construction work that was to have been completed during the five-year plan. The main reasons for this situation were the inadequate effectiveness of the design solutions for the foundations and supports of the power transmission lines and, as a consequence, significant amounts of manual labor, and also incomplete deliveries and nonfulfillment of the standard time periods for construction.

In power-related construction there was a significant dispersion of capital investments for numerous projects, which resulted in the extension of construction time periods. The assignment for labor productivity growth was not fulfilled.

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In the 11th Five-Year Plan the power industry workers and the power station builders must not only make up for lost ground, but achieve new successes.

The "Basic directions for the economic and social development of the USSR for the years 1981 through 1985 and for the period up to 1990", which was approved by the 26th Party Congress, call for the generation of electricity in 1985 to reach 1,550 to 1,600 billion kW-hours. For the AES's the target is 220 to 225 billion kW-hours; and for the GES's the target is 230 to 235 billion kW-hours.

To fulfill this program it is necessary to assimilate capital investments and to fulfill an amount of construction and installation work which exceeds by 20 percent the appropriate indicators for the 10th Five-Year Plan.

In the years 1981 through 1985 it is planned to obtain more than 70 percent of the growth in electric power generation at AES's and GES's. In the European portion of the Soviet Union nearly all growth in the production of electricity is to come from atomic electric power stations, for which it is planned to introduce from 24 to 25 million kW of new capacities at AES's.

A significant (more than 200 percent) increase in the production of electric power at atomic power stations in 1985 as compared with 1980, the accomplishment of an essentially new trend in the centralized heating of large cities through the construction of powerful ATETs, particularly the Odesskaya ATETs with a planned rated capacity of two million kW, and also the designing and construction of atomic power and heating plants (AST) in Gor'kiy and Voronezh - all of these developments promote the improvement of the fuel and power balance of the Soviet Union and make it possible to substantially raise the quality of the electrification of all sectors of the national economy and way of life.

An extensive program for the construction of atomic power stations was brought about by the need to conserve fuel and power resources, including the best kinds such as oil and natural gas, and to improve the structure of the Soviet Union's fuel and power balance.

In accordance with the planned development of the Ekibastuz and Kansk-Achinsk fuel and power complexes the rated capacity of power stations near the Ekibastuz coal basin by 1985 must be six million kW, while the rated capacity of the power stations for the Kansk-Achinsk complex is to be 1.6 million kW.

The inclusion of the Kansk-Achinsk and Ekibastuz coal in the power balance of the European regions of the Soviet Union and the Urals has been complicated by the inadequate carrying capacity of the railroads. By 1985 it is planned to complete a direct current 1,500 kV power transmission line between Ekibastuz and the Center and an alternating

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current 1,150 kV power line from Ekibastuz to the Urals. The Ekibastuz to the Center line will be 2,400 kilometers in length. The completion of these power transmission lines will make it possible to transfer each year into the European portions of the Soviet Union and to the Urals no less than 50 billion kW-hours of electricity; this is the same as transporting 35 million tons of Ekibastuz coal, which would require 600,000 railroad cars.

Reducing the shipments of fuel is provided in several instances by the efficient use of local resources. In the Central Asian region, for example, this task is solved by constructing the Angrenskaya and Talmardzhanskaya GRES's, which burn locally available coal and natural gas, which will make it possible to free as many as 200,000 railroad cars. The use of Tyumen'skaya Oblast natural gas from the oil fields for the production of electricity will make it possible by 1985 to bring the rated capacity of the electric power stations of the Tyumenskiy power complex to 5.5 million kW. In the 11th Five-Year Plan as regards the subsequent power units at the already operating Surgutskaya GRES-1 it is planned to introduce capacities at the Surgutskaya GRES-2 (1.6 million kW), as well as powerful power and heating plants in the cities of Tobol'sk and Tyumen'.

One of main directions in optimizing the fuel and power balance of the Soviet Union is central heating, since it provides a substantial reduction in the relative expenditures of fuel for the generation of electricity. The development of central heating and the further centralization of heating supply systems for the Soviet Union will be accomplished as in the previous period, by increasing the capacities of power and heating plants and the per-unit capacity of the primary and auxiliary equipment at increased parameters of steam and the gradual elimination of inefficient power equipment and small boilers. During the years of the 11th Five-Year Plan it is planned to introduce 14 million kW of capacity at TETs's of the USSR Ministry of Power and Electrification.

The task of conserving fuel and power resources is being solved by the construction of large hydroelectric power stations on rivers of Siberia, the Far East and Central Asia. The rated capacity of the Soviet Union's largest GES, the Sayano-Shushenskaya GES, will reach 5.2 million kW. Construction will get underway on new giants of the hydroelectric power industry - the Boguchanskaya GES (4 million kW), the Rogunskaya GES (3.6 million kW), the Bureyskaya GES (2 million kW), and the GES's of the Naryn' River cascade and others. The construction of the Nizhnekamskaya GES (1.25 million kW) and the Cheboksarskaya GES (1.4 million kW) will complete work on the hydroelectric power stations of the Volga River cascade.

To fulfill the program for the intensive assimilation of hydroelectric power resources it is necessary to accomplish several measures:

- improve the design solutions of the primary facilities, providing for a reduction in consumption of materials, use of labor and production cost;

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-the extensive adoption of retaining facilities comprised of earthen materials;

-the maximum use of the durable properties of concrete and rock for foundations, and also the more complete inclusion in the work of the rock mass, which hold the underground chamber outputs and tunnels;

-combining the functions of various elements of the hydrounit into a single facility;

-reducing the amount of land that is flooded;

-using technological structures, which make it possible to mechanize work to the fullest extent possible.

The requirement to force the construction of GES's in the 1981 to 1990 time period is caused not just by the tightness of the Soviet Union's fuel and power balance but by the need to regulate the run-off of rivers for the comprehensive utilization of water resources, and also by conditions for covering the changing portion of the load schedule.

Ensuring the reliable operation of an AES in a balanced, base mode is possible only by introducing within the western regions of the European portion of the Soviet Union in the near future some 8 to 10 million kW of capacity at water storage electric power stations. For this reason the construction of GAES must be considered an important aspect of the program for the development of the construction of atomic power stations (in the USA, for example, at present the capacity of GAES's is 20 percent of the capacity of atomic power stations). Along with the GAES's it is necessary to build other maneuverable power plants - particularly the steam and gas power plants.

The efficient development of power complexes in the eastern regions of the Soviet Union depends largely upon the timely production of equipment for the above-mentioned 1,500 kV and 1,150 kV power transmission lines. There are no barriers preventing the USSR Ministry of Power and Electrification from assimilating the new power transmission lines: the necessary design documentation has been prepared and the basic solutions for the line portion of these power lines have been developed. However, the lag in assimilating the production of equipment for them by the electrical equipment industry is threatened by a delay in the efficient use of power resources. The builders of the USSR Ministry of Power and Electrification must speed up the construction of plants for the manufacture of this equipment.

At the present time the USSR Unified Power System (YeES) has been created. The availability of power connections between the power systems significantly increases the economicalness and reliability of the power supply to the national economy. The joint operation of the power systems in the YeES has made it possible to install units with a maximum per-unit rated capacity and to enlarge the power stations. Increasing the per-unit rated capacity of power stations makes it possible

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to reduce the amount of materials used in them and to more efficiently use the production capacities of the power machine building plants; it also promotes an increase in labor productivity in construction.

The Unified Power System has made it possible through the use of the optimal loading of jointly operating power stations and increasing the generation of electricity on improved equipment to raise the economicalness of the operation of the electric power industry as a sector of the national economy. During the years 1971 through 1980 the relative expenditure of fuel per kW-hour of electricity, which was produced at thermal electric power stations for the Unified Power System, was reduced from 364 to 328 grams per kW-hour, which provided a savings of more than 100 million tons of conventional fuel. More than 60 percent of these savings were obtained due to the optimization of operating modes in all parts of the YeES - power stations, power networks and power consumers.

Not yet included in the USSR's YeES are the operating power systems of Central Asia and the Far East and several power systems of distant regions of the Soviet Union.

The unified power systems of the European CEMA nations are operating in parallel with the USSR's YeES: Bulgaria, Hungary, Poland, East Germany, Czechoslovakia, and Romania; and in the East, Mongolia. The USSR's YeES provides electric power to several capitalist nations: Finland, Norway, and Turkey.

During the years of the 10th Five-Year Plan the USSR's YeES, which accounts for more than 85 percent of the Soviet Union's production of electricity, was further developed. The unified power systems of Siberia, the Gur'yevskaya power system, the Kotlasskiy power junction of the Arkhangel'skaya power system were connected with the national power system. The Central Asian Unified Power System was completed.

In the 11th Five-Year Plan the process of increasing the per-unit rated capacity of power units and power stations will continue, as will the creation of large power complexes. Increasing the per-unit rated capacity of power stations and the rated capacity of flows and long-distance power transmission from power complexes in the eastern portion of the USSR's YeES, and also the need to increase the reliability of the YeES requires a significant increase in the throughput capacity of the basic network as compared with the present level. On the main lines (Northwest - Center - South, Center - Volga River area - Urals - Kazakh SSR - Siberia) the throughput capacity of the intersystem connections of the USSR's YeES must reach 4 to 6 million kW. The 750 kV electric power networks in the Northwest, the South and partially the Center will be further developed; emphasis will be put on electric power networks for carrying and distributing the capacities of atomic electric power stations.

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Problems having to do with the reliability of the national economy's power supply and ensuring the stability, efficiency and economicalness of the Unified Power System take on special importance. To efficiently monitor the operation of the YeES in normal modes considering the significant growth in the rated capacity of power stations, the length and load of intersystem transits, an automatic mode regulation system is being created for the frequency and transfers of capacity.

Existing means for an automatic system to prevent emergencies have made it possible to increase the throughput capacity of the basic networks of the USSR's YeES and to prevent quite a few serious emergencies. The further improvement and development of anti-emergency control will proceed toward completing the system using centralized computer systems for anti-emergency automation in various regions of the USSR's YeES and the development of anti-emergency control systems on the scale of the power associations and a central coordinating system of emergency prevention for the entire USSR YeES.

A great deal of attention must be devoted to increasing the technical-economic indicators of the operation of the electric power networks of the power systems and, in particular, to reducing power losses and improving the quality of voltage for the consumers. To accomplish this it will be necessary to raise the degree of compensation of the reactive loads by equipping the network with compensation devices for the reactive capacity. Thus, the introduction of compensating devices for just one million kilovars will make it possible to reduce power losses by 300 million kW-hours per year and to conserve no less than 100,000 tons of conventional fuel.

The USSR Ministry of Power and Electrification is devoting a great deal of attention to including new sources of energy within the fuel and power balance of the Soviet Union. The next 5 to 10 years will be years of the experimental-industrial assimilation of the first MHD /magneto-hydrodynamic/ units, and geothermal and solar power units. The use of solar energy for providing heat in the southern regions of the Soviet Union can provide an annual savings amounting to 20 to 25 million tons of conventional fuel. Solar electric power stations in the distant future can provide an output of electricity amounting to 10 percent of all electricity generated in the Soviet Union. In 1985 an experimental solar electric power station with a rated capacity of 5 MW will be put into operation. A decision has been made to construct a large geothermal electric power station in Kamchatka.

The words spoken by the General Secretary of the CPSU Central Committee and Chairman of the Presidium of the USSR Supreme Soviet, L. I. Brezhnev, must become definitive in our work. The following words were delivered by Brezhnev in his report to the Party Congress: "The new five-year plan will be a serious examination for the builders. A special feature

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of the five-year plan will be the universal concentration of forces on the rapid completion and start-up of those enterprises, which are able to provide us with the greatest growth in product output and to open up the bottlenecks. We have already embraced this path and we must follow it without fail."

In conclusion permit me to assure the readers that the Soviet Union's power workers are handling the tasks posed by the the 26th Party Congress with honor.

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ELECTRIC POWER

POWER AND ELECTRIFICATION FIRST DEPUTY MINISTER ON CONSTRUCTION PROJECTS

Moscow ENERGETICHESKOYE STROITEL'STVO in Russian No 11, Nov 81 pp
6 - 11

/Article by P. P. Falaleyev, First Deputy Minister of Power and Electrification: "Decisions of 26th Party Congress and the Tasks of the Power Builders"

/Text/ In the 11th Five-Year Plan the power industry workers and the builders of power industry facilities face important tasks in the further development of the power industry as one of the base sectors of the national economy.

In his report to the 26th Party Congress, Comrade L. I. Brezhnev said, "a mandatory prerequisite for solving all national economic tasks - both of a production and social nature - is the development of heavy industry. This concerns its base sectors and primarily the fuel and energy sectors."

Within the USSR Ministry of Power and Electrification a great deal of experience has been accumulated in the construction of power industry facilities; the efforts of the power industry builders have resulted in the creation of a powerful energy potential for the Soviet Union. The Reftinskaya, Zaporozhskaya and Uglegorskaya GRES's, the Bratskaya, Krasnoyarskaya, Ust'-Il'inskaya, Nurekskaya, Zeyskaya, Ingurskaya, and Chirkeyanskaya GES's, the Kurskaya, Chernobyl'skaya, and Beloyarskaya AES's, and many other electric power stations are the pride of the Soviet Union's power industry.

Quite a few successes in the power industry construction program were achieved during the 10th Five-Year Plan. New, efficient draft designs were realized; and the technology for rapid construction was assimilated. Based upon the analysis of the experience that has been accumulated in the area of rapid construction of the Ladyzhinskaya and Zaporozhskaya GRES's, designs for powerful thermal electric power stations have been created, which have 500 and 800 MW power units. The construction of these power stations is to be done at a rapid pace. This is particularly true of the Ekibastuzskaya GRES's and the Bereznovskaya GRES's of the Kansh-Achinsk Fuel and Power Complex (KATEK).

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The flow-line technology for erecting the main buildings of the GRES using new types of installation cranes, the SKR-2200EM and the SKR-3500EM, has been approved for the construction of the Ekibastuzskaya GRES-1. The cranes are to be manufactured at plants subordinate to the Glavenergostroymekhanizatsiya /Main Administration for the Mechanization of Power Industry Construction/. At present these cranes are basic to the construction of atomic electric power stations and powerful GRES's.

The construction of series-produced plant-readied gas and fuel oil thermal electric power and heating plants /TETs-ZIGM/ has been assimilated.

A beginning was made for the industrialization of the construction of atomic electric power stations. A technology for manufacturing and installing sectional panels and reinforced concrete form units has been developed and is now being adopted. The concrete form units are made of precast reinforced concrete for the reactor rooms and the special housings of an AES. Concrete pumps are now being used extensively.

In hydroelectric power station construction - at the Sayano-Shushenskaya, Ingurskaya, Zeyskaya, Chirkeyskaya and other GES's - advanced experience in the comprehensive mechanization of concrete work has become quite commonplace. This includes preparing the units for concrete pouring, transporting, smoothing and thickening of the concrete mixture; it also includes the use of tents for the pouring of concrete during the winter, etc. At plants of the USSR Ministry of Power and Electrification they are now manufacturing powerful concrete pouring cranes, the KBGS-1000, concrete pumps and other mechanisms for concrete work. All of this has made it possible to reduce labor expenditures for concrete work by as much as 2.5-fold to 3-fold as compared with similar indicators achieved in the 9th Five-Year Plan.

In the construction of the Kurpsayskaya GES the so-called "Toktogul'skiy" comprehensive mechanized method of layered concrete pouring has been further developed. In combination with the use of construction industry base and the housing built for the Toktogul'skaya GES - the upper stage of the cascade, and the comprehensive mechanization of work, they were able over a period of five years (1976-1980) to complete the basic work and to introduce the first unit of the Kurpsayskaya GES. This experience of cascade construction must be further developed.

A step forward has been taken in the construction of the electric power network. The flow-line-rapid technology was successfully adopted during the construction of the 750 kV high-voltage power transmission line between Leningrad and Moscow, the Western Ukraine substation and Al'bertirsha (Hungary), the Chernobyl'skaya AES and the Western Ukraine substation, and others.

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New, industrial support and foundation designs are now in use. This includes anchor-angle supports with reinforced concrete columns, light metal supports for the 750 kV power transmission lines. In the construction of substations extensive use is made of sections of rapidly installed buildings (BMZ). Also, the batch transformer unitized substations (KTPB) of a high voltage are now in extensive use.

During the past five-year plan in accordance with the plan for the adoption of new equipment the industry of the sector has manufactured more than 600 new designations of machines, mechanisms, structures and equipment, which are being used both at plants of the construction industry and at the construction sites.

It is difficult to enumerate all that the power industry builders have done that is progressive and efficient. Their experience and achievements have been given a great deal of publicity in the pages of the journal ENERGETICHESKOYE STROITEL'STVO and in other publications of the USSR Ministry of Power and Electrification. At the same time this leading experience is often not used on an extensive basis; many managers and the collectives that they oversee at construction projects continue to work in the old way; this results in a worsening of the ministry's work indicators overall. This situation is one of the reasons why the USSR Ministry of Power and Electrification failed to fulfill its assignments for the 10th Five-Year Plan.

During the period 1976 through 1980 the annual introduction of new power capacities for the USSR Ministry of Power and Electrification amounted to 10 to 12 million kW, which was below the planned assignments (such a level was achieved as early as the 8th Five-Year Plan).

The assignments for the introduction of power capacities at the Eki-bastuzskaya GRES-1 were not fulfilled; and the needed pace of construction at the Berezovskaya GRES-1 of the KATEK and the Permskaya GRES, the Surgutskaya GRES-1, was not achieved; and the construction of power industry projects in the Far East and Siberia continues to lag behind.

Construction of atomic electric power stations proceeded very unsatisfactorily. Throughout the entire five-year plan there were serious shortcomings in design work, in the delivery of equipment, and particularly in the organization of work. For this reason the timely completion of power capacities at the Chernobyl'skaya, Kurskaya, Smolenskaya, Yuzhno-Ukrainskaya and Rovenskaya AES's was not accomplished; and they did not manage to create started projects for the fulfillment of the 1981 assignments.

The time period for the realization of a scientific result remains great - from the concept to its adoption takes from 7 to 9 years, sometimes longer. As examples of this we can cite the prolonged time periods for the adoption of continuous methods of doing concrete and ground-rock work during the construction of dams for hydrounits,

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the combine digging of hydrotechnical tunnels, the technology for installing power transmission line wires under stress, and so forth.

According to estimates of the designers, the use of such an important reserve as the mass adoption of new equipment will make it possible to each year assimilate 300 to 400 million rubles worth of construction and installation work without bringing in additional labor resources.

In the course of the entire five-year plan the allocated funds for the electric power industry sector were not assimilated, especially for newly started projects and new construction undertakings; this has resulted in a reduction in the construction start-up and irregularities in the introduction of power capacities (as a rule, the introduction was accomplished at the end of the year).

In spite of the reduction in the level of the use of production capacities of construction industry plants, the schedule for the delivery of construction structures was largely observed; however, there were instances when the equipment sets were not complete. In addition, there was and continues to be a lag in the output of structures of an increased plant readiness, inventory and rapidly-erected buildings, inventory concrete forms and other structures.

It must be noted that the planned assignments for such a key indicator as the growth in labor productivity were not fulfilled - the figure was only 13.4 percent rather than the planned 28.5 percent. This situation evolved primarily as the consequence of the unsatisfactory organization of work, the inefficient use of equipment and also significant losses of work time.

During the years of the 10th Five-Year Plan the cost of operating machines and mechanisms increased by 44 percent in conjunction with a growth in the amounts of contract work amounting to 9 percent and a 13.4 percent growth in labor productivity, which attests to unused reserves in operating the construction equipment and means that are poorly mechanized.

The percentage of manual labor in the power industry construction effort was 39.1 percent in 1980, meaning that it was reduced by only three percent as compared with 1975. Nearly 200,000 workers are still engaged in manual operations within the construction and installation organizations of the sector.

Up until the present the losses of work time have remained high; in this regard, nearly half of the losses take place as the result of internal problems: due to the lack of a work front, the late delivery of concrete and other materials, and also violations of labor discipline.

The level of adopting the brigade method in 1980 was 25 percent as opposed to 30 percent called for by the plan; we lag behind the other construction ministries for this indicator.

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Such sound forms of socialist competition as the "workers' relay race" are not being used adequately. The creative cooperation of the scientific-research and design organizations and industrial enterprises with the builders, which was proven at the Sayano-Shushenskaya GES, is not being emulated.

The reduction in the pace of the growth of labor productivity in the power industry construction is to a large extent caused by shortcomings in work with personnel. Due to the underevaluation of the importance of constructing housing during the years of the 10th Five-Year Plan, the plan for the completion of 1,300,000 square meters of floor space and social and cultural facilities was not fulfilled. This accounts for the turnover of labor.

It is necessary to note that the pace of power industry construction was delayed by several objective reasons as well. These factors must not be overlooked. The most important of these reasons is the unsatisfactory provision of the power industry construction projects with material-technical resources. During the past five-year plan some 915,000 tons of metal, 790,000 tons of cement, and 2.9 million cubic meters of lumber were not supplied. The supply of materials by quarters was uneven; there were delays in the delivery of certain rolled metals and pipes, which disrupted the assembly of the structures being manufactured.

The ministry was not fully supplied with construction machines and motor transport, particularly powerful, highly-productive machines. Domestic industry still has not assimilated the series production of the powerful bulldozers, tractors and pneumatic-drive cranes which are so needed within the sector. Nor can Soviet plants produce complete concrete plants with concrete mixers capable of handling 750, 1,200 and 2,400 liters of concrete, concrete mixer trucks, concrete pump trucks with a high feed of 100 meters or more of concrete mixture, piledriving units, powerful vibrorollers, plaster and painting units, and other equipment, including mechanization means for work in the northern regions of the Soviet Union.

The USSR Ministry of Power and Electrification was equally poorly supplied with machine-tool equipment, welding equipment and materials, spare parts for the construction machines and motor vehicles, and the means for low-level mechanization, the need for which was satisfied by only fifty percent.

There were and now continue to be serious shortcomings in providing key construction projects with both primary and assembly technological equipment. The violation of the delivery schedules for equipment, the lack of complete equipment sets and the poor quality of the assemblies that are delivered have a negative effect upon the time periods for the completion of projects; this leads to an increase in the number of installers amounting to 15 to 20 percent (due to the need to eliminate defects) and the duration of the installation.

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There is no need to continue the list of shortcomings and their reasons which are hindering our work.

In his report to the 26th Party Congress, L. I. Brezhnev noted on this score that, "...the chief reason is that the force of inertia, tradition, and custom, which evolved at a time when quantity was more important than quality, has not been overcome." For this reason our most important task is to eliminate outdated traditions and customs.

As the Chairman of the USSR Council of Ministers N. A. Tikhonov pointed out in his report "Basic directions for the economic and social development of the USSR in the years 1981 through 1985 and for the period to 1990", "the 11th Five-Year Plan will be the first stage in the realization of L. I. Brezhnev's energy program, which was developed at his initiative. The growth in the production of electric power will take place largely through the use of nuclear fuel, hydroelectric power, and the use of coal in the eastern regions of the Soviet Union. In the years 1981 through 1985 the atomic power stations and hydroelectric power stations will account for more than 70 percent of the growth in electricity generation; in the European portion of the Soviet Union these sources will provide almost all growth in power production. The construction of large thermal electric power stations is to be based upon inexpensive coal, extracted by the strip-mining method in the Kansk-Achinsk and Ekibastuz coal basins." Thus, the party congress documents clearly define the tasks for the development of the power industry and basic changes in its structure.

In the 11th Five-Year Plan the USSR Ministry of Power and Electrification must:

- introduce new power capacities amounting to 70 million kW, including 25 million kW at atomic electric power stations;
- introduce at full capacity the Ekibastuzskaya GRES-1 (eight power units of 500 MW each), the first power units at the GRES-2 and the first 800 MW power unit at the Berezovskaya GRES-1;
- speed up the construction of the Surgutskaya GRES-2, having ensured the introduction at this power station of the first 800 MW power units; and to undertake work on other electric power stations in this region;
- complete the construction of the Sayano-Shushenskaya, Nizhnekamskaya, Cheboksarskaya GES's and to continue work on the other hydroelectric power stations; to complete work on the Zagorskaya GAES /water storage electric power station/ - the first powerful water-storage electric power station in the center of the European portion of the USSR;
- continue the construction of electric power stations in Siberia, the Far East, and Central Asia considering the need to ensure the intensive growth of power consumption and the comprehensive use of water resources;

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-to put into operation the largest, intersystem alternating current 1,150 kV power transmission line between the cities of Ekibastuz - Kustanay - Chelyabinsk; and to continue the construction of direct current 1,500 kV power lines;

-to continue (using the forces of the USSR Ministry of Power and Electrification's construction organizations) the construction of industrial projects for other ministries.

The overall program of contract work while preserving the load on industrial construction at the level of the current year will increase to 36 billion rubles, with an actual fulfillment of the program in the 10th Five-Year Plan of 30 billion rubles.

The fulfillment of these tasks is connected with several specific features and difficulties.

The thermal electric power stations that are now under construction and which will burn coal require a higher consumption of materials than do the gas and fuel oil power stations, which were built predominantly in the previous period. The atomic electric power stations according to design solutions and production technology of the construction and installation work, as is known, are more complicated and materials-intensive than are the thermal electric power stations. In constructing an AES there is a significant increase in the relative labor expenditures; and the workers and engineering and technical personnel must have a higher skill level. In connection with this the physical volumes of work in the 11th Five-Year Plan will increase significantly as compared with similar volumes in the 10th Five-Year Plan (See Table).

Work	Actually fulfilled in 10th FYP	To be fulfilled in 11th FYP
Ground clearing (cubic meters)	4,018,353	4,805,264 (119.6 percent)
Loading and unloading (thousands of tons)	865,145	1,048,716 (121.2 percent)
Installation of construction structures (thousands of tons)	104,833	129,872 (123.9 percent)
Concrete and reinforced concrete (thousands of cubic meters)	50,642	58,442 (115.4 percent)

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Plastering, thousands of square meters	109,565	125,326 (114.4 percent)
Painting, thousands of square meters	298,711	344,161 (115.2 percent)
Roofing from rolled materials, thousands of square meters	34,177	44,806 (131.1 percent)

* The growth in volumes of work is given as a percent enclosed within parentheses.

The fulfillment of such volumes of work will require large expenditures of labor and an appropriate increase in the number of workers, if there is not a substantial improvement in the organization and technology of construction and a sharp increase in labor productivity is not obtained.

The majority of the power industry construction projects of the 11th Five-Year Plan are being built in uninhabited regions far from the existing large construction organizations and construction industry bases. In connection with this to fulfill the established assignments for volumes of construction and installation work and the introduction of power capacities at these projects it is necessary to do more work to strengthen existing and to create new construction collectives, after carrying out an extensive program of building housing and cultural and social facilities.

Raising the technical level of the engineering and technical workers and the skills of the workers takes on special importance. It is necessary to also take into consideration that in the 1980's there will be a reduction in the growth of labor resources, which in turn will create great difficulties in the assembly of new projects by personnel brought in from the outside.

These and other difficulties for accomplishing the power industry program of the 11th Five-Year Plan require the search for effective ways to overcome them. Comrade L. I. Brezhnev provides a clear and precise answer to this problem in his speech to the 26th Party Congress: "Each sector faces its own pressing tasks and specific problems. But there are problems which are common to all spheres of the national economy. One such problem is to complete the switch to the predominantly intensive path of development." It is precisely on the basis of the intensification of construction and installation work during the construction of power industry facilities that we can successfully solve the tasks that we face. For their practical realization it is necessary for us to:

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-all construction and installation organizations must more extensively adopt the advanced experience that has been accumulated within the power industry construction program;

-practical measures must be taken to implement the scientific-technical developments, which ensure the adoption of more efficient design solutions and progressive technology for the execution of construction and installation work;

-more attention must be given to questions having to do with conserving labor resources and their rational use; and a reduction in losses of work time must be achieved.

Stemming from the basic assignments of the 26th Party Congress, within the USSR Ministry of Power and Electrification specific measures have been developed to raise the efficiency of construction work and to improve the organization and technology of power industry construction during the years 1981 through 1985 and to conserve material and labor resources. The most important of these measures are the following.

-raising the organization level of planning, management and economic work in accordance with the decree of the CPSU Central Committee and the USSR Council of Ministers "regarding the improvement of planning and strengthening the influence of the economic mechanism upon raising the efficiency of production and the quality of work." To solve this problem as quickly as possible within the current five-year plan it is necessary to:

-to accomplish the planning of capital investments and construction and installation work on power industry projects in strict compliance with the norms for the duration of construction and the plant standards; to decisively fight against the dispersal of capital investments, by concentrating funds primarily on the key projects, for which it is necessary to reexamine the title lists of power industry projects for the years 1981 through 1985;

-to provide in conjunction with the five-year plan and annual planning a balance of the plans for construction and installation work with the capacities of the contract organizations, and also with the labor, material, and financial resources;

-to develop a plan of action for raising the labor productivity in power industry construction during the years 1981 through 1985;

-to develop and realize measures aimed at improving the economic work at all management levels of the USSR Ministry of Power and Electrification;

-to conclude the development of a general plan for sector management, including power industry construction, and to hasten its adoption;

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- to create a network of all-union construction and installation and industrial associations and to strengthen small-scale construction and installation organizations; to organize additional specialized subelements, which specialize in certain types of work at the AES's, GRES's, GES's and GAES's which are under construction; to improve the structure and specialization of the construction and installation organizations, which construct power networks; and to eliminate subelements which are functioning in parallel;

- to develop existing and create new automatic control systems within the construction and installation associations, trusts, organizations and construction industry enterprises; to improve the quality of management and engineering preparation at the projects under construction;

- to develop and accomplish a system of measures to strengthen control and personal responsibility of subelement managers of the central apparatus and construction and installation associations and organizations for fulfillment of the assignments for power industry construction.

A radical improvement in the work of the design and scientific-research organizations, raising its efficiency, reducing the time periods for adopting progressive developments. Improving the designing based upon the standardization of components, structures and equipment, the unitized assembly of buildings and facilities, the use of construction-technological assemblies and construction structures of a high plant readiness. To solve these problems it is necessary to:

- to develop and adopt standard, unified designs of thermal electric power stations with power units having a per-unit rated capacity of 500 MW, which burn Ekibastuz high-ash content coal; and with power units having a per-unit rated capacity of 800 MW which burn Kansk-Achinsk coal, as well as the natural gas and by-product natural gas from the Surgut oil fields;

- to create and adopt a standardized AES design with VVER-1000 reactors and a design for a series-produced AES with RBMK-1000 reactors;

- to use the economic advantages of constructing power complexes within the composition of the AES's, GAES's, and GES's as was done at the Yuzhno-Ukrainskaya complex;

- to bring the level of using industrial prefabricated structures in the above-ground portion of an AES to 60 - 70 percent;

- to conclude the designing of the series-produced coal dust plant-manufactured TETs as it applies to all kinds of turbine equipment;

- to come up with standardized designs for GAES's with hydrounits with a per-unit rated capacity of 200 MW, rated for a pressure of 80 to 120 meters;

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- to provide for the total standardization and a high degree of plant readiness of prefabricated reinforced concrete form units and panels for AES's, reinforced concrete and steel supporting structures, wall enclosures, roofing, partitions, pipelines and structures for the buildings of the GRES's, AES's and GAES's that are under construction;

- to stipulate the use of new types of foundations and footings (including pile-supported), and also the use of the "wall in the ground" method;

- to more extensively adopt in the construction of underground facilities and hydrotechnical tunnels lightened forms (using pre-stressed anchors, vibro-pressed and poured concrete, etc.);

- to achieve the maximum standardization of structures used in the construction of power networks, considering the specific nature of regional conditions; to develop special structures of foundations beneath the supports of power transmission lines (including for rocky, permafrost, and heaving soils), and also the thermal pilings; to create new types of steel and reinforced concrete supports for power transmission lines;

- to develop and adopt new types of rapidly installed substations, including the assembled 220-110 kV transformer substations, and also the 35/10 kV unit-type assembled transformer substations for supplying electricity to rural areas;

- to expand the adoption of efficient materials and structures and sizes of rolled metal, fireproof coatings for steel structures, polymer rolled materials, grade 500 and higher claydite-concrete, and the ash and slag from TES's.

Improving the organization and technology of construction and installation work by expanding the use of high-speed and flow-line methods, the adoption of efficient design-technological solutions, new types of construction equipment and special attachments; raising the quality of construction and installation work. To improve the organization and technology of construction it is planned:

- to adopt a set of measures aimed at initiating the continuous flow line in construction of the GRES's for the Ekibastuz and Kansk-Achinsk fuel and power complexes with the creation and assimilation of the capacities of regional production-assembly bases (RPKB);

- during the construction of AES's with VVER-1000 reactors according to a standardized design to realize the experience available at the Zaporozhskaya AES in organizing the high-speed and flow-line construction, and to assimilate an efficient high-speed technology for erecting protective casings for the reactor sections; to adopt a progressive technology for the installation and concrete work of large reinforced concrete and steel compartments of an increased plant readiness for wall structures, and also pre-stressed coatings for special housings and AES reactor sections;

- to develop and use automatic equipment for the welding of vertical and horizontal seams in the steel facings of reactor sections;

- to improve the volumetric reinforced concrete cells of structures without welded connections of the fitting and to adopt them in the construction of RBMK-type reactors;

- to assimilate the highly industrialized technology for the production of monolithic concrete work using modern concrete pumps, concrete mixing trucks, conveyor transport, etc.;

- to develop and adopt highly-efficient methods and means for monitoring the quality of basic construction and installation work;

- to create the mandatory technology of construction and installation work for projects being constructed at thermal electric and atomic electric power stations, including series-produced stations, having planned for the expansion of the frequency of using inventory concrete forms, the use of construction and construction-technological fully plant-prepared units, the use of rolled coverings for floors and finishing of facilities, etc.;

- to adopt a progressive technology in the execution of special and installation work (in particular in the installation of thermomechanical equipment), and also the optimizing installation units of equipment, and to use new installation mechanisms, to adopt industrial structures, to assimilate the method of spray-coating compositions on coverings; in the installation of electrical equipment and means of automation to accomplish the enlargement and adjustment of equipment outside of the area of installation, and to make more extensive use of volumetric units;

- to expand the production and extent of use of individual series of highly efficient inventory prefabricated, container and mobile buildings, to develop and adopt mobile and transportable boilers for a temporary heating supply systems to housing and construction industry bases at power stations under construction, a transportable concrete mixing unit with a 1,500 liter capacity, rapidly installed cement storage facilities, concrete mixing units and other projects for the concrete mixing work;

- to create and assimilate highly-mechanized equipment sets for carrying massive concrete jobs for the construction of hydroelectric power stations, including the continuous conveyor pouring of concrete in complex reinforced facilities;

- to adopt cyclical-flow-line methods for erecting rock and dirt dams, which require the use of conveyor transport and special equipment for the layered vibro-compacting of earth, and also to assimilate the continuous technology for backfilling earthen masses;

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-in the construction of GAES's to assimilate the comprehensive mechanized technology for manufacturing and installing preassembled steel reinforced concrete large diameter pipelines, to develop and adopt the technology for preparing and pouring fine-gravel concretes, high speed methods for developing and reinforcing power unit trenches in soils that are not water saturated, and also the comprehensive technology for the year-round erection of dams out of local materials using continuous transport;

-in the underground hydroelectric construction to develop and assimilate light-weight structures for facilities, new technological methods for the construction of projects using blast-hole and combine methods of tunneling and highly efficient ventilation systems, new technology for rigging large-span drifts, which call for the use of the rock mass and anchors with a high support capacity;

-in electric power network construction to develop and adopt a progressive, highly-mechanized technology for constructing the first section of a 1,500 kV direct current power transmission line between Ekibastuz and the Center and a 1,150 kV alternating current power line between Ekibastuz and the Urals;

-to assimilate methods for the flow-line and flow-line-high-speed construction of electric power network projects;

-to develop and use progressive highly-efficient work technologies for laying foundations, installing supports, wires and cables in the construction of high voltage power transmission lines of different voltages;

-to create and adopt the technology for the construction of power transmission lines using new design solutions - foundations beneath the supports of new types, special foundations for permafrost, heaving and soft soils, foundationless securing of supports in rock, thermopilings, and also new efficient support designs; to adopt the technology for the rapid construction of substations using BMZ sections, UTsB units and other progressive solutions;

-to develop and use standard technological documentation for electric power network construction;

-to create and adopt an efficient system for supporting power transmission line and substation construction with material-technical resources in the form of technological equipment sets.

The extensive use of progressive machinery and mechanisms, the development of special means of mechanization and transport, the further mechanization of heavy and labor intensive processes, reducing the percentage of manual labor. In the area of improving the mechanization of work it is planned:

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- to increase the capacity and productivity of construction machinery now produced by industry, which will make it possible by 1985 to free 8,000 to 10,000 highly-skilled machine operators;

- to more extensively adopt special machinery, including mobile concrete mixing cyclical-action units, capable of operating at minus 30 degrees C., concrete mixing trucks with a capacity of 1.7 to 8 cubic meters, concrete pumps, heavy vibrorollers, machines for mechanizing the construction of 750, 1,150 and 1,500 kV power lines;

- to adopt for power industry construction no less than 50 designations of new highly-productive construction machines, mechanisms and equipment, not now supplied by Soviet industry, including new machines and mechanisms for the construction of power transmission lines;

- to manufacture during the five-year plan at plants and repair enterprises of the USSR Ministry of Power and Electrification the means for small-scale mechanization, mechanized tools and attachments amounting to not less than 350 million rubles; to develop and assimilate at plants of the USSR Ministry of Power and Electrification not less than 80 types of new efficient means for small-scale mechanization; to modernize and construct plants for the production of small-scale mechanization means;

- to raise the efficiency of the operation of the trailer park through the intensive use of trailers for shipping fillers, brick, thermal insulating materials, and large reinforced concrete articles;

- to ensure an annual reduction in the inter-shift idle times of machines amounting to not less than 2 to 3 percent by improving the organization of construction and installation work and raising the level of the technical readiness of machines.

The growth in industrialization through the adoption of progressive design solutions, the development of the construction industry, the use of new structures and materials. It is planned:

- to provide the allocation of capital investments, material and labor resources for the development of a base for the construction industry primarily for the construction of atomic electric power stations, energy complexes, and also hydroelectric power stations in Siberia and the Far East;

- to develop and execute a program for the modernization and equipment refitting of the enterprises of the construction industry in order to fully realize available reserves, to bring the level of the use of production capacities of plants of the construction industry to 90 percent;

- to expand the production of architectural parts of a high plant readiness for housing and cultural and social construction projects;

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-to raise the quality and degree of plant readiness of construction structures, to adopt a system of comprehensive deliveries of metal and prefabricated reinforced concrete structures, including parts for large-panel house building (KPD):

-to organize the mass production of structures for the construction of atomic electric power stations, by providing (starting in 1982) for the manufacture of not less than 70,000 tons of reinforced metal structures of walls and facings and not less than 150,000 cubic meters of reinforced concrete form spatial units per year;

-to speed up the construction of atomic power station construction combines;

-to increase the annual volume of manufacturing of light-weight structures; by 1985 to raise the output of "sandwich" type panels made of polymers (especially as substitutes for metal pipelines, which are subject to the aggressive environments) and to raise the production of such panels to 10,000 tons per year;

-to accomplish the construction of 22 units for the recovery of ash and slag wastes and to provide for the extensive use of ash in power industry-related construction;

-to increase the amounts of prefabricated housing construction, primarily for atomic power stations that are under construction, by providing by 1985 for the growth in capacity for KPD production throughout the ministry to 4,000,000 square meters, and to provide an 85 to 90 percent use of large-panel houses; all plants are to switch to the production of an improved series of houses.

For conserving material resources based upon an improvement of planned norms and production expenditure norms, the adoption of economical design solutions, improving the organization and technology of construction work it is planned to reduce (as compared with 1980) the expenditure of rolled metal by 7.2 percent and cement by 6.2 percent.

It is necessary to accomplish several measures to improve the material technical support system, to strengthen control over the timely realization of allocated funds and also to deal with pressing problems that arise at the construction sites.

Control must be improved over the expenditure of materials in construction and at construction industry enterprises.

On the basis of these measures for raising the efficiency of power industry construction the ministry must ensure the growth of labor productivity by 21 percent, including in 1981 - on the average by 4.3 percent through the adoption of progressive design solutions (4.4 percent), mechanization of work (4.3 percent), improving the technology and organization of production (7.5 percent), and improving the organization of labor (4.8 percent).

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Special importance is attached to problems having to do with the more efficient use of the work force. In the 10th Five-Year Plan it was planned to emphasize a reduction in the number of workers engaged in construction and installation work and an increase in workers in the services and related areas. Thus, the percentage of workers engaged primarily in construction was reduced from 68.3 percent in 1975 to 65.6 percent in 1980, while workers in the services and related areas increased from 31.7 percent in 1975 to 34.4 percent in 1980.

During the 10th Five-Year Plan the number of workers engaged in primary construction increased by 7,650 men, or 1.5 percent, while those engaged in services and related areas increased by 36,000 men, or by 13 percent.

The numbers of engineering and technical workers (ITR) are increasing more intensively as compared with ordinary laborers. During the five-year period the number of ITR and employees increased by 13,400 men, while the number of workers of ordinary laborers fell by 7,000 men. The number of ITR and employees per 100 laborers increased from 21 men in 1975 to 24.7 men in 1980.

This trend is the consequence of shortcomings which exist in the structure of organizations and in numerous management elements. The entire growth in the work force must be directed at construction and installation work and more work must be done to improve the structure of workers that has evolved.

Expanding the sphere of the use of the brigade method, the adoption of new forms of socialist competition, improving the forms of moral and material incentives, improving the work with personnel and reducing the turnover rate, the realization of plans for housing and cultural and social facility construction, and raising the skill-level of workers - these are the crucial problems of personnel policy, for the solution of which it is planned:

- to accomplish measures for the more efficient use of material and moral incentives, which will tend to keep workers on the job;
- to develop and accomplish a program for the rapid construction of housing and cultural and services facilities for the fuel and energy complexes, atomic power stations and power industry facilities which are located in remote and sparsely populated areas of the Soviet Union;
- to develop and organize in each organization the adoption of a system of social measures aimed at reducing labor turnover and stabilizing the labor collectives;
- to provide for a reduction in the percentage of manual labor from 39 percent in 1979 to 35 percent in 1985 by reducing labor-intensive basic kinds of jobs;

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-to develop and adopt in power industry construction practice a system of mobile construction and installation organizations, expeditionary and watch construction methods;

-to raise the efficiency of the system for raising skill-levels on problems having to do with the economics and management of power industry construction for the managers of construction and installation and industrial associations, trusts and production organizations, by devoting special attention to the training of workers and ITR for the construction of atomic power stations.

The realization of these vital measures as well as the proposals of the collectives of construction and installation organizations, the design and scientific-research institutes, the design bureaus, the enterprises of the construction industry, the operating services, the start-up and adjustment elements and other subelements will make it possible to successfully fulfill the assignments spelled out in the decisions of the 26th Party Congress and the State Plan for the economic and social development of the USSR for the years 1981 through 1985.

To achieve these goals for the development of power industry construction and construction work will require a great deal from the forces of all labor collectives of the USSR Ministry of Power and Electrification. It is necessary to critically review its possibilities, to identify additional reserves, to eliminate existing shortcomings, and, what is particularly important, to improve the style of engineering and technical and administrative management.

"We are speaking of a style of work, which organically combines assiduity and discipline with bold initiative and enterprise. Practicalness and efficiency - with an aspiration to accomplish great deeds. A critical attitude toward shortcomings - with an unwavering confidence in the historical advantages of the path that we have selected." These are the instructions of the General Secretary of the CPSU Central Committee, Chairman of the Presidium of the USSR Supreme Soviet, Comrade L.I. Brezhnev. And they must become the foundation for the practical work of each manager of the sector's enterprises and organizations.

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ELECTRIC POWER

ATOMIC POWER STATION CONSTRUCTION MUST ACCELERATE

Moscow ENERGETICHESKOYE STROITEL'STVO in Russian No 11, Nov 81 pp 14-17

/Article by A. N. Semenov, Deputy Minister of the USSR Ministry of Power and Electrification: "Tasks of the Design, Construction and Installation Organizations in Reducing the Amount of Time for and Raising the Efficiency of Constructing Atomic Electric Power stations"

/Text In the 10th Five-Year Plan the construction of atomic electric power stations (AES) was developed at a rapid pace. The annual volume of construction and installation work in AES construction increased from 210 million rubles in 1976 to 460 million rubles in 1980. The average annual growth of this indicator was 24 percent during the years of the 10th Five-Year Plan.

Experience in AES construction has demonstrated the full complexity of the tasks associated with the development of a new field of the power industry. The high requirements upon the skill level of construction and installation personnel have resulted in the need to create specialized collectives of builders and installers.

The carrying out of a large program of AES construction has made it necessary to come up with some serious measures to ensure the comprehensive material-technical supply, organize the manufacture and delivery of special prefabricated reinforced concrete and steel structures, equip the construction organizations with large-capacity installation cranes, concrete pumps and other construction equipment, and also observe time periods and completeness of equipment deliveries.

Putting an AES in areas that are far from the large populated areas has required the construction of well-appointed settlements for the many thousands of construction workers and AES operators.

In the 10th Five-Year Plan subelements of the USSR Ministry of Power and Electrification devoted a great deal of attention to the creation of a production base for the further undertaking of AES construction. The Zaporozh'ye house building combine and the Southern-Ukrainskiy and Smolenskiy KPD /Large-panel house building plants were put into operation, with capacities of 140,000 and 40,000 square meters of articles

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per year, respectively. The Chernobyl'skiy, Kurskiy and Burshtynskiy house building combines were modernized. The Kurskiy non-standard AES equipment plant was put into operation; and construction was started on the Zaporozhskiy non-standard equipment plant. The specialized construction structures combine at the Zaporozhskaya AES began manufacturing product; similar combines are now being built at the Chernobyl'skaya, Kurskaya, Balakovskaya and Khmel'nitskaya AES's. Other prefabricated reinforced concrete and steel structures plants are now being modernized.

In addition, during the years 1976 through 1980 at AES settlements some 1,367,000 square meters of housing have been built; schools for 12,020 students and kindergartens for 5,470 children have been built. Other social and cultural facilities have also been constructed.

However, in spite of the significant amount of work completed by the subelements of the USSR Ministry of Power and Electrification, the plan for completing AES's during the 10th Five-Year Plan was not met.

The main difficulties encountered by the ministry had to do with the lack of balance between the assignments for introducing power capacities and the funds, material-technical and labor resources, and the capabilities of the construction-installation organizations that were earmarked for this work. The inadequate undertaking of construction and installation work and housing construction has resulted in an increase in the amount of time required for AES construction. It has also disrupted the pace of introducing capacities during the year (capacities are chiefly introduced in the fourth quarter) and has resulted in an extreme concentration of workers in the pre-start-up and start-up years. This has had a negative impact upon the quality of construction and installation work and the labor productivity of the workers.

The principle of the rapid construction of housing and cultural and social and service facilities has been violated. The design organizations have taken a formal attitude toward designing AES settlements -- they have not taken into consideration the real changes in the demographic composition of the settlements. This has made it impossible to create needed conditions for the placement of AES builders, installers and operators on a timely basis.

The lack of a smooth pace in carrying out work has hindered the rational utilization of construction-installation equipment, which, it should be noted, the All-Union Association Soyuzatomenergostroy does not have enough of. The amount of machinery available to labor within this association is 3,300 rubles per worker, which is half the amount available in the better equipped main administrations: Glavgidroenergo and Glavenergopromkompleksstroy.

There have been serious shortcomings in the designing of AES's. Teploelektroproyekt and Gidroproyekt imeni S. Ya. Zhukov are the two main institutes, which were given the job of designing atomic power stations. They have not always provided the development of technical-economic

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justifications and the technical designs for start-up and initial sets of work for several AES's. At present there are some projects scheduled for completion during the 11th Five-Year Plan for which there are no technical designs.

The quality of the designs has not always been satisfactory.

There are delays in work connected with the creation of standardized AES designs. The individual designing of almost every AES in connection with changes in technological equipment has made it necessary to make systematic revisions to designs, which has complicated the engineering preparation work. These problems and the fact that the AES construction sites are not adequately supplied with modern, mobile construction and installation equipment have delayed the adoption of a progressive technology for executing work.

The inadequate industrialization of AES structures and the fact that industrial enterprises are not prepared to manufacture structures for AES's have made it impossible to achieve the needed level of labor productivity.

In addition, in the years 1978 through 1980 there were significantly increased demands placed upon ensuring the safety of operating atomic power stations and protecting the environment. In connection with this several reserve and other systems were put into operation, which ensure AES safety. Appropriate changes, which ensure AES safety in conditions of the strongest seismic activity, were incorporated into the designs.

These circumstances have resulted not only in the need to rework a significant amount of design documentation but also in the increase in the amount of construction and installation work on the start-up sets of power units.

Mention must also be made of the shortage of skilled personnel, including both the designers and builders of atomic power stations.

For example, at the Gidroproyekt Institute imeni S. Ya. Zhuk they receive significantly fewer young specialists than they did five years ago; this is true even though the amount of work for designing AES's with RBMK reactors has increased markedly over the past two five-year plans. The number of leading specialists, technologists and builders engaged in AES designing at Gidroproyekt has fallen rather than gone up. Thus, in 1976 at the Moscow, Leningrad and Ukrainian departments of this institute there were 600 specialists engaged in designing; at present there are 470; more than 800 men are needed for this work. A similar situation exists with personnel engaged in AES designing at the Teploelektroproyekt Institute.

The problem of manning AES construction sites is particularly complicated. Today at AES-related construction and installation work there

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are no more than three percent of the engineering and technical workers who possess a special technical education in AES construction, only 25 percent of the workers have any experience in the construction of AES's, and all others are working on an AES for the first.

This is true even though it has been evident over the past two five-year plans that the USSR Ministry of Power and Electrification had actively begun to build atomic power stations. Soviet institutes could have started graduating some good specialists.

In 1981 in Moscow, Leningrad, Odessa and other cities some 300 specialists in AES construction will be trained. However, this amount will form only a small portion of the requirement for designers, builders and installers. The USSR Ministry of Power and Electrification must help all subelements engaged in designing and constructing AES's to acquire the needed specialists, including the young specialists.

No less important is the problem of work quality at AES's. To ensure the reliable and safe operation of atomic power stations increased demands are placed upon the quality of the construction and installation work. There is a need for repeated monitoring of all operations, for example a 100 percent monitoring of the density of all welded joints, since the least deviation from the norm can result in the appearance of defects, which must be eliminated. It needs to be pointed out that the equipment being delivered often has defects, elimination of which in construction conditions requires additional labor expenditures and, as a consequence, leads to the work taking longer to do.

When doing concrete work there are often problems with the geometry of structures; their surfaces are rough and uneven and there are leaks in spots where the monolithic concrete structures join other structures. Leaks in welded seams lead to serious losses of time and additional labor expenditures and the need to eliminate them.

Start-up and adjustment work are among the most complicated and important tasks, during which the quality of the installation of thermomechanical and electrotechnical equipment, and management and control systems is revealed. The complexity of organizing the start-up and adjustment work is found in the fact that it is necessary to combine and coordinate the actions of numerous start-up and adjustment organizations. Thus, in the start-up and adjustment work on power unit No 5 at the Novovoronezhskaya AES there were 23 participating organizations. The total amount of time required for this work (from the hydraulic tests and the circulatory flushing to the start-up) can reach one year and sometimes significantly exceeds the norm.

A certain lag in AES construction during the 10th Five-Year Plan can be attributed to the fact that the USSR Ministry of Power and Electrification approached the solution of tasks for organizing and managing the construction of AES's from traditional ministerial positions, without considering the special features dictated by the specific nature of atomic power stations.

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A complicated situation has evolved in the construction of atomic power stations this year. Over the past eight months only 89 percent of the planned work volumes has been completed. And although as compared with this same time period in 1980 this represents a 123 percent increase, the situation cannot be considered satisfactory.

Today one of the key tasks is to do everything possible to concentrate the efforts of the USSR Ministry of Power and Electrification's sub-elements on the start-up projects for the current year. This includes the construction of the Chernobyl'skaya, Rovenskaya and Smolenskaya AES's.

The All-Union Soyuzatomenergostroy Association has not fully resolved the problem of supporting these projects with needed numbers of workers. At the same time the construction projects are not making full use of material-technical and labor resources at their disposal. At many construction sites (Smolenskaya, Kurskaya and other AES's) they are still failing to fulfill the plan for growth in labor productivity and are using construction equipment somewhat inefficiently.

The association needs to work more diligently to fulfill the assignments for the current year.

To fulfill the assignments handed out by the 26th Party Congress for the construction of atomic power stations during the years 1981 through 1985 and on to 1990, the USSR Ministry of Power and Electrification has developed a special program. In accordance with the accepted long-term rapid development of the atomic power industry, during the years of the 11th Five-Year Plan Soviet atomic power stations must receive 21.3 million kW of new capacities and three million square meters of housing. The percentage of installed rated capacity of atomic power stations in the 1990's must reach 20 percent of all power capacity; the installed capacity of AES's is to surpass that of the hydroelectric power stations. By this time as much as 40 percent of electric power in the European portion of the USSR is to be generated at atomic power stations.

The increase in the installed rated capacity of Soviet AES's over the next ten years will be accomplished through the construction of power units with two types of thermal neutron reactors: encased with water under pressure - the VVER-1000, and the channel RBMK-1000 and RBMK-1500. The construction of AES's with fast neutron reactors, the BN-800 and the BN-1600, will be continued.

In accomplishing the program for the introduction of capacities at atomic power stations there are dozens of ministries, departments, equipment and material supplying plants, collectives of designers, builders and operators and other organizations participating; for this reason it is essential to ensure a balance between the assignments for the introduction of power capacities and the financial, labor and material-technical resources. Particular attention must be

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given to questions having to do with the timely delivery of equipment, increasing its quality and completeness, and the rapid construction of housing and cultural, social, and service-related facilities.

While constructing the main power units with RBMK-1000 and VVER-1000 reactors, the collectives of design, construction, installation, adjusting and operating organizations of the ministry adopted several progressive solutions, the use of which at the AES's now under construction will make it possible to significantly reduce labor expenditures and length of time required for the construction of power units.

A program for the flow-line construction of AES's has been developed, which ensures a reduction in the amount of time required for their construction with a simultaneous reduction in labor expenditures and the use of materials. The first stage in the realization of this program was the creation of a standard design for a series-produced AES using VVER-1000 reactors.

The technical-economic indicators of this design are better than for the design of the Yuzhno-Ukrainskaya AES: the amount of space required for the station has been reduced by 10 percent, the relative volume of construction of buildings by 12 percent, the number of operating personnel by 18 percent, and the cost reduced from 318 to 265-280 rubles per kW. The Zaporozhskaya, Rostovskaya, Balakovskaya, Khmel'nitskaya, Krymskaya, and Bashkirskaya AES's are being built according to this design, as are the second sections of the Yuzhno-Ukrainskaya and Rovenskaya AES's.

Work is continuing on standardizing the design solutions of atomic power stations with RBMK-1000 reactors, which will ensure a reduction in the cost of AES's by as much as 10 to 12 rubles per kilowatt. This year the main work on creating standardized designs must be completed. At the same time the Teploelektroproyekt and Gridroproyekt imeni S. Ya. Zhuk institutes must constantly improve the quality of the design solutions.

At the same time it must be emphasized that there is a need to provide the designers with a solid and unaltered plan of construction and installation work and financing in accordance with their designing of projects, which will make it possible to improve the quality of the designs and to release technical documentation within the established time periods.

The "designing" year starts 18 months prior to the construction planning year. By this time it is necessary to have not only an approved amount of construction and installation work, but the inter-structural construction title lists for the construction planning year.

This rule must be stable. Execution of this rule will not only simplify the designing of AES's, but the construction of atomic power stations as well, since the builders will have an opportunity to evaluate, plan and justify the resources that they will need to fulfill

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their planned assignments. In view of the complexity of this matter the All-Union Soyuzatomenergostroy Association (customer) and GlavPEU /main planning and economic administration/ must do everything possible to hasten its solution.

It is apparent that it is necessary to rely upon the proposals of the design organizations and to introduce within the USSR Ministry of Power and Electrification a system, by which the design and surveying work plan for each AES would be approved three months prior to the start of the "design" year along with the appropriate financing of the work. This plan should be coordinated with the deputy ministers who are in charge of designing and constructing AES's.

Glavniiprojekt /main scientific-research and designing institute/ needs to reexamine the load on institutes and the sequence of the work that is being carried out.

The All-Union Soyuzatomenergostroy Association is the main organization responsible for the construction of atomic electric power stations for the USSR Ministry of Power and Electrification (this organization does 85 percent of all AES construction and installation work). The USSR Ministry of Power and Electrification has planned measures to further strengthen this organization.

At the same time Glavtsentroenergostroy (Kalininskaya and Kostromskaya AES's) is also involved in the construction of atomic power stations; Glavzavodspetsstroy organizations are also partially involved in such work.

To raise the level of specialization, ensure the high quality of work in the installation of construction structures it is planned to expand the sphere of work of All-Union Association Gidrospetsstroy and the Gidromontazh Trust, by giving them the task of doing special work at the construction sites of all AES's.

Measures are planned for assisting the workers and engineering and technical workers who are assembling the atomic power stations under construction.

The USSR Ministry of Power and Electrification is also taking several other steps aimed at sharply improving the construction of atomic power stations.

A special role in ensuring the annual introduction of 5 to 6 million kW of capacity at AES's is played by specialized installation organizations of Glavteploenergomontazh, Glavelektromontazh, and Soyuzenergozashchita. These organizations within a very short period of time must prepare the needed production bases and increase the collectives of installers for ensuring a 2- to 3-fold increase in work volumes.

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Within Soyuzatomenergo a specialized start-up and adjustment subelement should be organized, which could do start-up and adjustment work at AES's on a comprehensive and skilled basis.

The creation of large collectives, which perform large annual volumes of work at AES sites, requires a significant amount of housing construction with all facilities for cultural and social purposes. It is necessary to improve the work of the Soyuzenergozhilstroy Association and to speed up the construction of new house-building combines to meet the needs for housing construction. To create normal living conditions for the builders and operators of the AES's, the Glavnii-proyekt and Soyuzatomenergo need to complete the work that they undertook with Gosgrazhdanproyekt to clarify the norms for designing housing at AES's.

The USSR Ministry of Power and Electrification has done a lot of work to equip AES construction projects with modern mechanisms and transport, including those of their own manufacture - SKR-2200 and SKR-3500 cranes, equipment for the preliminary stressing of concrete, concrete pumps, etc. However, to ensure the planned annual introduction of capacities this is insufficient and Glavenergoostroymekhanizatsiya /main administration for the mechanization of power-industry construction must solve the problem of providing AES's with construction equipment as required. The Energomekhanizatsiya Trust must achieve a more complete mechanization of labor-intensive jobs and a reduction in manual labor outlays.

In addition, the USSR Ministry of Power and Electrification is planning several measures to improve the organizational work and to raise the quality of planning, designing, the technology and organization of construction.

It is necessary to disseminate the recently CPSU Central Committee approved initiative of the Gidroproyekt Institute imeni S. Ya. Zhuk, which is aimed at raising the quality of the scientific-technical level of designing in order to ensure a reduction in material and labor expenditures, as well as the estimated cost of construction. It is also necessary to generalize and widely adopt such experience of socialist competition of the enterprises and construction projects as the "workers' relay race", the "agreement of the 28" and others.

The USSR Ministry of Power and Electrification faces difficult tasks. Everything possible is being done to organize the work of the design, construction, installation, start-up and adjustment, operating, and scientific-research subelements to fulfill the assignment for the introduction of new capacities at AES's during the 11th Five-Year Plan and all pledges connected with the solution of tasks for the development of the atomic power industry posed by the 26th Party Congress.

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ELECTRIC POWER

ATOMIC POWER GENERATION IN 11TH FIVE-YEAR PLAN

Moscow ENERGETICHESKOYE STROITEL'STVO in Russian No 11, Nov 81 pp 23-25

/Article by L. M. Voronin, candidate for the degree of doctor of technical sciences: "Development of the Atomic Power Industry in the 11th Five-Year Plan"7

/Text/ The extensive construction of atomic power stations within the USSR has become an important task, without the solution of which it is becoming increasingly difficult to ensure a fuel and power balance for the Soviet Union.

At present within the USSR there are 12 AES's in operation; their total rated capacity is nearly 15 million kW, including:

-with encased water cooled reactors (VVER) - the Novovoronezhskaya AES (total capacity of all power units is 2,450,000 kW), the Kol'skaya AES (1,320,000 kW), the Armyanskaya AES (815,000 kW) and the Rovenskaya AES (440,000 kW);

-with channel uranium-graphite reactors - the Leningradskaya AES (4,000,000 kW), the Chernobyl'skaya AES and the Kurskaya AES (2,000,000 kW each), the Bilibinskaya AES (48,000 kW), the Sibirskaya AES (600,000 kW), and Beloyarskaya AES (300,000 kW);

-with fast breeder reactors - Shevchenkovskaya AES (150,000 kW) and the Beloyarskaya AES (600,000 kW);

-with VK-50 and BOR-60 reactors - the Ul'yanovskaya AES (62,000 kW).

The production of electricity at AES's is increasing from year to year. In 1980 alone atomic power stations generated nearly 73 billion kW-hours of electricity. This is more electricity than was generated at AES's throughout the entire 9th Five-Year Plan. Altogether from the year 1976 through 1980 atomic power stations produced more than 230 billion kW-hours of electricity.

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During the years of the 10th Five-Year Plan a new important step forward was taken in the development of the atomic power industry. New capacities were put into operation at the Kurskaya, Chernobyl'skaya, Lenin-gradskaya, Armyanskaya, Bilibinskaya and Rovenskaya AES's. Work got underway to start-up new power units (primarily large units with a per-unit electrical capacity of 1,000 MW) at the Chernobyl'skaya, Smolenskaya, Yuzhno-Ukrainskaya, Kol'skaya, Kalininskaya AES's and several other AES's.

During this same time period work was successfully completed on the construction of the main power units with VVER-1000 and BN-600 reactors at the Novovoronezhskaya and Beloyarskaya AES's, which is of much importance for the further development of the atomic power industry.

The construction and start-up in April 1980 of power unit No 3 with a BN-600 reactor at the Beloyarskaya AES made it possible to accumulate valuable experience in the construction, installation and adjustment of the world's largest reactor unit with a liquid metal (sodium) cooling agent. During the installation of the primary technological equipment progressive methods were devised for the enlarged preassembly of the reactor housing, large-size and other technological equipment, and also the technology of welding, thermal processing and monitoring the quality of welded joints of unique equipment and pipelines. Well thought-out planning and organization of work in adjusting and testing the equipment and systems of this power unit made it possible to assimilate within a relatively short period of time (nearly five months) the basic modes of operation of the power unit at a level of 80 percent of the nominal capacity.

Considering the experience gained in the designing, constructing and start-up the power unit with the BN-600 reactor, at present work is in progress to come up with new, more improved equipment designs and systems of series-produced power units with fast breeder reactors, with an electric power capacity of 800 and 1,600 MW.

The start-up in 1980 at the Novovoronezhskaya AES of power unit No 5 with the first model of the VVER-1000 reactor unit demonstrated the correctness of the main design and planning developments.

The experience gained in constructing, starting up and assimilating the designed capacity of the power unit provides a basis for relying upon the successful construction of series-produced AES's with VVER-1000 reactors and upon the further improvement of their technical-economic indicators.

In order to reduce the amount of time required for the construction and assimilation of planned capacities of large power units with VVER-1000 reactor units the designs of new AES's call for the design of the fuel assemblies to be modernized (the so-called uncovered fuel assemblies are used) and for the number of SUZ regulatory organs to be reduced from 109 to 61; also the lay-out decisions are to be improved for several facilities of the main housing: rather than two 500 MW turbines there will be a single 1,000 MW turbounit, etc.

The 26th Party Congress defined a new program for the further rapid development of the atomic power industry within the Soviet Union.

"The basic directions for the economic and social development of the USSR for the years 1981 through 1985 and for the period up to 1990" call for the intensive increase in the generation of electric power at atomic electric power stations. Thus, in 1985 the generation of electricity at AES's will reach 220 to 225 billion kW-hours, which will be 14 percent of all electricity produced in the USSR and will almost equal the total generation of electricity at hydroelectric power stations. This will make it possible to free more than 70,000,000 tons of conventional organic fuel from the fuel and power balance of the Soviet Union each year.

In the 11th Five-Year Plan the pace of introducing new capacities at atomic power stations as compared with the level of the past five-year plan will nearly double. During the period from 1981 through 1985 at AES's it is planned to introduce 24 to 25 million kW of new capacities. New power units with series-produced VVER-1000 reactors are now being built and will soon be put into operation at the Kalininskaya, Zaporozhskaya, Yuzhno-Ukrainskaya, Khmel'nitskaya, Rovenskaya, Krymskaya, Rostovskaya, and Balakovskaya AES's and at the Odesskaya ATETs. New power units with RBMK-10000 reactors will be put into operation at the Chernobyl'skaya, Smolenskaya and Kurskaya AES's. Work on the first section (of two power units with powerful RBMK-1500 reactors) of the Ignalinskaya AES, with an electric power capacity of 3,000 MW, will be completed.

During the 11th Five-Year Plan it is expected to realize an essentially new direction in the centralized heating system of large cities. We are speaking about the construction of several powerful atomic electric power and heating plants (ATETs) and atomic heating supply stations (AST), which will be able to reliably meet the needs of housing complexes for heat. Since a significant amount of scarce fuel (1.5-fold more than for the needs of electric power) is required for the production of low-potential heat, required by the industrial enterprises and populated areas, the extensive adoption of AST's and ATETs's is extremely important and advantageous for the national economy.

As noted previously, at present the Odesskaya ATETs is being built; it will have an electrical capacity of 2,000 MW. It is the first large atomic power station, which will generate both electricity and as much as 7,560 gigajoules of heat per hour for consumers. At such ATETs's it is planned to install series-produced VVER-1000 reactors and two (per power unit) TK-500 turbines with special heating supply steam separators, which ensure the maximum output from each turbounit of as much as 1,890 gigajoules of heat per hour and 450 MW of electricity.

Two main AST's (Gor'kiy and Voronezh) are now under construction. The first power units of these stations have a heat capacity of 500 MW and will be put into operation during the 11th Five-Year Plan.

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Important new tasks for the further development of the atomic power industry, which evolve from the decisions of the 26th Party Congress, require the development and execution of urgent measures to improve the designing, construction, installation, start-up and assimilation of new capacities at the AES's.

The USSR Ministry of Power and Electrification's design organizations must in the near future complete the development of designs for standard, multi-unit AES's with VVER-1000 and RBMK-1000 reactors and create a design for a series-produced AES with fast breeder reactors. In these designs there must be the extensive dissemination for the progressive construction structures and materials, as well as lay-out and technological solutions, which make it possible to use industrial methods of construction and installation.

The projected construction of a large series of multi-unit AES's (Zaporozhskaya, Balakovskaya, Rostovskaya, Khmel'nitskaya, and Rovenskaya AES's) with VVER-1000 reactors according to a unified standardized design will promote a substantial rise in the quality of construction and installation work and a reduction in labor intensiveness and length of time required for the construction of an AES.

One of the important tasks of the specialists of the design institutes is to adopt into the practice of designing and constructing AES's, ATETs's and AST's the modeling of the basic projects, which will make it possible to improve lay-out solutions, to improve the quality of design documentation, to raise the quality and efficiency of installation work, to decrease the probability of errors in designing, thereby eliminating the need to do significant amounts of construction and installation work (for rerouting pipelines and cable communications, for making openings and holes in walls and coverings of facilities, etc.) When releasing the working technical documentation the technology and by-stage nature of construction, installation and adjustment must be strictly taken into consideration.

The AES construction collectives face serious tasks. They must develop and realize special measures for increasing the capacities of the construction organizations, who are in charge of AES construction.

Each large AES that is under construction must be equipped with a constant and adequate collective of skilled builders in all speciality areas (including finishers), which provide for the rapid (in regard to the installation time periods and the adjustments) and qualitative construction of buildings and other AES engineering facilities.

An urgent problem is also the need to raise the level of engineering preparation for the construction of an AES and the quality of the designs for the organization of construction work.

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The successful and timely fulfillment of tasks for the introduction of new capacities at AES's in the 11th Five-Year Plan will to a large extent depend upon the power machine builders. The timely and complete delivery of equipment and pipelines is one of the main conditions required for reducing the time periods of construction and for ensuring the timely start-up and assimilation of the new power units at the AES's.

The introduction and assimilation of planned rated capacity for the first section of the Volgodonsk Atommash Plant and the planned significant increase in the production capacities of several other plants which manufacture equipment for AES's will make it possible to solve this important task. An important role in providing the AES's now under construction with equipment is being played by contracts that were made for the 11th Five-Year Plan with several CEMA-member nations (within the framework of long-term target programs for cooperation up to the year 1990) for cooperation and production specialization in equipment for atomic power stations.

Thus, the power industry builders have every opportunity to successfully fulfill the key assignment of the CPSU - to provide for the rapid development of the atomic power industry in the 11th Five-Year Plan and for the period up to 1990.

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ELECTRIC POWER

PROBLEMS OF ENERGY PRODUCTION

Moscow TEPLoENERGETIKA in Russian No 5, May 82 pp 2-5

[Article by D.G. Zhimarin, Corresponding Member, USSR Academy of Sciences]

[Text] The energy crisis in the West consists essentially of the fact that the economy of the industrially developed capitalist countries (calculating for maximum profit) is oriented toward unjustifiably broad utilization of liquid fuel, mostly imported. As a result, the proportion of liquid fuel in the overall energy consumption of the industrially developed capitalist countries grew from 32.6 percent in 1955 to 51.8 percent in 1973. The share of oil within the structure of the energy balance of the industrially developed capitalist countries was almost 50 percent in 1979. Of the 1 billion 826 million tons of liquid fuel consumed by this group of countries in 1979, only 628 million tons (a little more than one-third) was obtained by the countries themselves; over 1 billion 200 million tons were imported, mostly from developing countries in the Near and Far East, Africa, Latin America and Indonesia.

The amount of industrial production (especially military) delivered to the developing countries was extremely high, and increased systematically.

The actual concept of "energy crisis" is quite arbitrary, since the geological base of organic fuel in many capitalist countries is sufficient to meet their needs.

The essence of the matter is that artificial reduction in oil prices led to a drop in the utilization of local solid fuel. For example, between 1955 and 1979, the share of coal accounted for in the total energy consumption of capitalist countries dropped from 49 to 23 percent.

The almost 10-fold increase in oil prices in recent years equalized the relationship between the prices of fuel and industrial articles to some extent. As a result, the developing countries of the Near and Far East (Saudi Arabia, Kuwait, Oman, etc.) received huge monetary sums which, in turn, led to the appearance of masses of so-called "petrodollars" on the world money market. All of this had a destabilizing influence on the economy of the western countries, and led to a drop in production, reduced business activity and a sharp increase in joblessness.

The governments of the industrially developed capitalist countries undertook

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convulsive searches to find ways to overcome the energy crisis and to adapt their economy to the new energy situation.

These ways included the following:

- accelerated reduction in the consumption of liquid fuel by replacing it with other power resources;
- increasing the proportion of mining and consumption of solid fuel, even if degraded environmental conditions resulted;
- an all-out reduction in the specific consumption of all types of fuel in the output of industrial and agricultural production;
- development and accomplishment of broad measures to create and introduce new technological processes, especially so-called low-energy and pollution-free technologies;
- direct reduction in the consumption of light petroleum products, primarily by motor vehicle transportation, by switching over to more economical motor vehicles and sharply increasing gasoline prices;
- intensive search for economically justified production processes for obtaining liquid and gaseous products from solid fuels;
- accelerating work to bring renewable energy sources (solar, geothermal, wind) into the fuel-energy balance;
- fuller utilization of the hydroelectric potential of rivers;
- expanding the use of atomic energy.

The Socialist countries, which developed their economy on the basis of state planning for the development of the fuel-energy complex, are not threatened by the energy crisis. Nonetheless, this does not mean that Socialist countries have no energy problems at all. There are such problems, although they are completely different in nature. The USSR, as well as other CEMA member countries, have developed and implemented measures for more economical consumption of liquid fuel.

In contrast to the capitalist countries, the USSR and other Socialist countries have both increased the proportion of liquid fuel consumed within the fuel-energy balance, and increased the mining and consumption of solid fuel. Systematic work is underway to reduce the specific consumption of fuel at power plants, and of heat and electricity in industrial technological processes and public utilities.

The Soviet Union is first in the world in the development of centralized heat supply based on combined production of electrical and heat energy at TETs.

Public transport is widely used (subway, buses, trolleys and trams). The production of economical light trucks has been arranged.

The USSR leads the world in the scope and extent of electrified railroads. These carry more than 50 percent of all freight handled by the country's railroads.

It must also be emphasized especially that the Soviet Union is one of the world leaders in the area of atomic energy. Nuclear power plants make it possible to reduce the consumption of organic fuels increasingly.

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Considering the new energy situation which has come about in the region covered by the European Economic Commission of the United Nations, the Soviet Union introduced a proposal to discuss the problems of the existing fuel-energy situation and to plan collective measures in this area.

The European Economic Commission of the United Nations (EEC) then created a temporary organ to prepare for a conference - a group of Senior Government Advisers on Energy.

This organ of the EEC was tasked to gather as much information as possible in the area of fuel and energy resources and to analyze it thoroughly; to draw up a working plan for the Senior Advisers; and to determine the most important energy problems for discussion at the all-Europe conference with participation of representatives from the US and Canada.

Since then, the Senior Government Advisers on Energy have received detailed information from the EEC member countries on the current status and prospects for development of production and consumption of fuel-energy resources.

This information has been presented for 1973, 1979, 1980, 1985, 1990 and 2000.

All of this extensive information was analyzed carefully by the staff of the Secretariat of the EEC with the participation of leading scientists and specialists from various countries.

The general conclusions coming from the data and planned programs of the European countries, US and Canada can be reduced to the following position.

All of the countries, without exception, put forth the basic task of reducing oil consumption by conserving it as rigorously as possible and replacing it in the production of electricity and heat and in industry with solid fuel, hydroelectric power, nuclear power, as well as non-traditional types of energy resources.

A number of large countries have put forth the task of obtaining liquid fuel from solid (coal, shale).

All of the countries believe that it is time for fundamental improvements in the area of energy consumption, and in developing and introducing those technological processes which make it possible to reduce fuel and energy consumption significantly in the output of production, meeting transportation needs, etc.

The trends in the area of power consumption by the European countries, the US and Canada are unavoidably reflected in the world energy balance, since these countries consume 58 percent of the entire world's production and 72 percent of the consumption of fuel-energy resources.

The structure of the untapped energy reserves in these countries does not correspond to the structure of their consumption: 86 percent of these reserves of mined fuel in these countries is made up of coal, while coal makes up only 26 percent of the fuel-energy balance. In contrast to this, only 5 and 8 percent, respectively, of

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the overall reserves are made up of oil and gas, while their consumption within the fuel and energy balance amount to 43 and 22 percent, respectively.

It is apparent from the data presented by these countries that the rate of growth of consumption of basic energy resources has dropped off in recent years in western Europe and the US.

The average annual increase in power consumption in these countries during 1965-1973 was 4.9 percent; this figure dropped to 1.7 percent during 1973-1980.

Absolute oil consumption in western Europe and North America had dropped to the 1973 level by 1980, and the proportion of oil in the overall energy consumption also began to drop.

As concerned production, many EEC countries have taken steps to increase the production of local energy raw materials by adopting rules regulating the import of energy resources. Considerable money has been allocated for expanding scientific research, and international cooperation is being developed. As a result, the total production of primary energy resources during 1973-1980 increased ahead of the demand in all of these countries.

The analysis of the Secretariat indicates that the EEC countries are traditional importers of energy resources, with western Europe as a whole importing oil, coal and gas; North America - oil; eastern Europe (except for the USSR) - oil and gas; the USSR is a major exporter of oil, gas, coal and electricity.

Analysis also indicates that the countries in western Europe are importing coal, even though they have reserves of their own; the amount of coal imported increased from 13 percent in 1973 to 19 percent in 1980.

During 1971-1980 the USSR increased its export of energy resources, which to a significant degree promoted the development of trade between the East and the West (between 1975 and 1980 the amount of net export from the USSR increased by 101.8 million tons).

The data presented and their analysis indicate that although there was an increase in energy consumption in most countries between 1973 and 1980, energy resources were utilized more efficiently, since the demand for energy per unit of output product dropped.

All of the participating countries presented detailed information on the development of energy resources and measures to improve their structure.

The table presents some basic data presented to the EEC of the United Nations by the Soviet Union and the US.

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Forecast Data for Development of Energy
Production in USSR and US

Indicators	1985		1990		2000	
	USSR	US	USSR	US	USSR	US
Production of basic fuel-energy resources (total), million tons	2350-2440	2153-2508	2685-3125	2313-2994	3240-4130	2827-3995
Comprising:						
solid fuel	545-565	696-797	675-845	834-1044	740-1150	1283-1566
liquid fuel	880-910	587-696	880-990	551-725	870-1025	594-848
gaseous fuel	720-750	565-638	840-975	536-703	1150-1350	464-703
nuclear energy	65-70	181-225	140-160	246-319	300-400	268-507
hydraulic energy	70-75	116-123	80-85	116-130	85-100	130-160
other types of energy	70	7-29	70	-	95-105	-
Net trade of fuel-energy resources	320-360*	341-644**	295-465*	130-507**	330-645*	37*-239**
Internal consumption	2020-2080	2690-2914	2390-2660	2769-3226	2910-3485	3096-3770
Delivered to consumers	990-1025	1947-2099	1230-1385	1943-2225	1370-1575	2071-2447

*export-net

**import-net

Note. Data for the USSR from Academy of Science members, as presented to EEC;
US figures - Energy Department estimates, also presented to EEC.

Summing up the energy indicators for the European countries, US and Canada, the Secretariat of the EEC reaches a number of conclusions, which consist of the following:

--the total demand for basic energy resources during 1980-1990 will continue to increase, by 30 percent in western Europe, by 23 percent in eastern Europe (except for the USSR), by 41 in the USSR, by 13 percent in North America and by 24 percent for the EEC region as a whole;

--it is expected that the demand for oil during the 1980s will remain stable; an absolute decrease in demand for oil is possible in North America (14 percent). It is suggested that the oil replacement policy will be especially successful in the area of electricity production, where the proportion of oil as a raw material in the EEC region as a whole will drop from 20 percent in 1973 to 9 percent in 1990, the proportion of automatic energy will increase accordingly from 3 to 21 percent, and the proportion of coal will drop from 44 percent in 1973 to 41 percent

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in 1990;

--local production of fuel-energy resources will exceed significantly the present levels of production in all parts of the EEC region in terms of types of energy raw material, including oil. By comparison with 1980, the proposed increase in the total volume of production by 1990 will be as follows, on the average: about 27 percent in the EEC region as a whole, 18 percent in North America, 36 percent in the USSR, 13 percent in western Europe and 35 percent in eastern Europe. It is also believed that the most substantial relative increase in local energy production will result from atomic energy (260 percent), coal (32 percent), hydraulic energy (24 percent) and gas (22 percent, primarily in the USSR);

--in 1990 coal will become an important local energy source in the EEC region, and will comprise 32 percent of the total production of primary energy resources, while oil will have a 25 percent share. The proportion of renewable energy sources (except hydraulic) will still be very small, below the possible levels;

--increased production of energy resources will engender an absolute increase in capital investments with respect to national products in all parts of the EEC region,

--the increase in oil imports in the EEC region as a whole will drop off; however, the proportion of imported oil in 1990 will remain high - 79 percent in western Europe, 80 percent in eastern Europe (except for the USSR) and 34 percent in North America;

--the replacement of oil and other factors will promote increased coal imports to western Europe, the proportion of which within the overall consumption of solid fuel in this portion of the region will increase from 19 percent in 1980 to 32 percent in 1999;

--trade in natural gas will expand further. It is expected that the demands of western Europe for imported natural gas will increase by a factor of 3 or 4, and the proportion of imported gas within the overall consumption will increase from 14 percent in 1980 to 37 percent in 1990.

Analyzing the development of fuel and energy resources up to 1990 and beyond, the EEC Secretariat emphasizes the special position and increased influence of the Soviet Union on the formation of the energy situation in western Europe.

In its calculations and estimates the EEC Secretariat uses as a basis the fact that the USSR will further expand the export of natural gas and electricity during the period up to 1990.

Considering the above, all of the European region countries, the US and Canada consider the universal conservation of fuel, heat and electricity to be the most urgent task for the entire upcoming developmental period.

Special attention has always been devoted to the problem of reducing the specific consumption of fuel, electricity and heat in this country. A whole complex of measures in this area are provided in the current five-year plan as well.

Based on the resolutions of the Party and government, Gosplan USSR, the USSR State Committee on Science and Technology and the USSR Academy of Sciences have developed measures to conserve fuel and energy resources over the five-year period on the scale of 160-170 million tons, including 70-80 million tons as a result of improving technological processes and employing new energy-consuming equipment.

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There are plans to reduce the specific consumption of fuel for electricial production from 328 tons of conventional fuel in 1980 to 3190320 tons of conventional fuel in 1985. As a result, 8-10 million tons of conventional fuel will be conserved in 1985.

The development of atomic power engineering is of major importance for reducing the consumption of mineral fuel. There are plans to increase the production of electricity by AES in the Soviet Union to 220-225 billion kWh by 1985, which will make it possible to reduce the annual (for 1985) consumption of mineral fuel by 50 million tons of conventional fuel as compared with 1980.

There are plans for measures to reduce electricity losses in power networks from 9.1 to 8.6 percent (1985), which will make it possible to save approximately 3 million tons of conventional fuel per year. Capital expenditures for the start-up of power capabilities will be reduced accordingly.

Major savings can be obtained by using secondary energy resources. There are plans to conserve 60-70 million tons of conventional fuel at the 1985 level.

Measures to save fuel and energy resources are based on scientific-research developments and the proposals of scientists. There are plans to use the developments of new methods of fuel ignition in boiling-layer furnaces, utilization of low-potential heat from ventilation installations, use of the heat from thermal and atomic power plants, etc.

It should be emphasized that the employment of secondary energy resources and modernization of technological equipment require approximately half the capital expenditures which are required for expanding fuel production.

Renewable energy sources - solar, wind, geothermal - must be included in the fuel-energy balance.

Hydraulic sources resulting from building large-scale GES in Siberia, Central Asia and the Transcaucasus will make a significant contribution to the fuel-energy balance.

There are plans to accelerate the construction of CAES, which will provide coverage for peak loads and will equalize the operating schedule of thermal electric plants at night.

A reduction in expenditures for producing primary energy resources and improvement of the fuel-energy balance can be obtained by improving the methods and means for producing coal, oil and gas and for transporting liquid and gas fuels.

The coal industry will expand coal production using the open method, which is most highly mechanized and cheapest.

The petroleum industry has plans to increase oil production from 43 to 50-60 percent; in 1985 an additional 8 million tons of fuel will be obtained as a result of increasing production.

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The construction of main pipelines for transporting gas at pressures of 10 MPa instead of 7 MPa will increase the throughput capacity by 33 percent (for the same type diameters).

We must recall the attempts of many countries (USSR, US, FRG, PNR) to process coal in order to obtain liquid, gas and chemical processes.

A USSR report on work done on power technological processing of Estonian shale and Kansk-Achinskiy coal in order to obtain shale oil, resins and gas, as well as chemical products in the future, received great attention from the Senior Energy Advisers.

A major role in increasing energy utilization efficiency is now played by the introduction of electronic computing facilities and automation systems in technological processes within energy management as well as industrial consumers of fuel and energy.

Scientific research and extensive practice have shown that automatic control systems provide an increase in the efficiency of all machinery, mechanisms and processes, all other conditions being equal, which is accompanied by a drop in the specific material expenditures per unit of production. At the same time, strict observance of the parameters and assigned norms result in improved product quality. In addition, the productivity of social labor becomes higher, its social nature changes; physical labor becomes a variety of mental labor.

All of the above measures to achieve technical progress in our country are laid out in integrated state programs for 1981-1985 developed by scientific-research institutes, design bureaus, enterprises, ministries and confirmed by the USSR State Committee on Science and Technology, Gosplan USSR and the USSR Academy of Sciences.

The task is now to ensure unconditional fulfillment of the assignments of the integrated programs and to raise the economy of the USSR to a new, higher and more efficient level.

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ENERGY CONSERVATION

CHELYABENERGO ECONOMIZES

Moscow ELEKTRICHESKIYE STANTSII in Russian No 5, May 82 pp 8-11

[Article by N.I. Shishkin, Director, Chelyabenergo, "Manage Economically".]

[Text] The Soviet people are working unceasingly to carry out the resolutions of the 26th Party Congress. Our continuing movement ahead, as the Summary Report of the CC CPSU to the Congress emphasizes, will depend increasingly upon skillful and efficient utilization of all available labor resources, basic funds, fuel and raw material, as well as produce of the fields and farms.

The unceasing growth in social production and the satisfaction of the various requirements of the workers are directly associated with planned increases in production of raw materials and all types of fuel and with increasing the output of electrical and thermal energy.

In order to execute the broad program of economic and social development of the country which has been planned for the 11th five-year plan and the 1980s we must use the huge raw material, fuel-energy and other material resources in production. The power workers in the Chelyabinsk power system have no more important and honorable task than to ensure uninterrupted high quality electricity for industry, agriculture, transport and the domestic needs of the population of the South Urals, the mobilization of existing resources to conserve fuel-energy and other resources and increasing the efficiency of energy production and the quality of work.

The tasks facing the power system during the 11th five-year plan are not easy ones, but they can be carried out; the foundation for their execution is provided by the results achieved by the collectives of the Chelyabenergo enterprises during the 10th five-year plan.

During the 10th five-year plan, the electrical and heat-producing capacity of the power system increased significantly. The following were brought on line:
--830,000 kW of turbin capacity, including a second 500,000 kW single-shaft turbine at the Troitskaya GRES. This has brought the Troitskaya GRES to its final capacity of 2 million 500 000 kW;
--boilers with a total steam output of 3,060 tons of steam per hour, and 7 water heating boilers with a total heating capacity of 700 Gcal/h.

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In 1980 55.2 percent of all electricity produced by the Chelyabinsk power system was obtained from 200-, 300- and 500 mW units.

During the 10th five-year plan over 10,000 km of power transmission lines carrying all voltages, as well as 2 million 717,000 kW·A of transformer capacity, were put into operation. The supply of electricity for agriculture in the Chelyabinskaya and Kurganskaya oblasts was improved significantly. It is sufficient to point out: that of the 10,000 km of power transmission lines carrying all voltages built during the 10th five-year plan, more than 9,000 km consist of VL [probably high-voltage lines] for agriculture.

During the five-year plan, the consumption of electricity by agriculture in the South Urals and Transurals increased by a factor of 1.7.

During the 10th five-year plan, power workers in the South Ural completed a substantial amount of work on conserving fuel and energy resources. During this period, the specific consumption of conventional fuel was reduced to 13.2 g per each kilowatt-hour produced, providing a savings of over 600,000 tons of conventional fuel.

A major contribution to reducing the specific consumption of fuel was provided by workers at the Troitskaya GRES, where a specific fuel consumption of 329 g/(kWh) has been achieved on 500-mW units. This indicator is one of the best in the country for analogous coal-burning equipment.

During the 10th five-year plan, intensive work was continued to further centralize heat supply. Heat was provided for the city of Troitsk after rehabilitation of the uneconomical phase-I turbines at the Troitskaya GRES.

The realization of marketable products during the five-year plan resulted in a profit of 7.5 million rubles over those called for in the plan.

New capacities were brought on line during the 10th five-year plan without increasing the number of personnel. The following data speak to this fact: the specific number of industrial production personnel at electric power plants and PRP [expansion not given] during the five-year plan was reduced by 0.35 people, comprising 1.41 people by the end of 1980 per 1000 kW of established power; for power networks, a personnel reduction of 0.47 people was achieved, resulting in an end figure of 2.64 people per 100 conventional units.

During this period, 778 new technology measures were introduced, providing savings of over 11 million rubles.

The introduction of measures for scientific organization of labor freed 255 people.

Modern computer technology is widely used in the power system. The second phase of an automated control system was put into production operation in 1980. This system employs a third-generation computer to carry out more than 150 tasks involved in line dispatcher control, planning, bookkeeping and accounting, energy sales and other subsystems. Two-thirds of these tasks were developed at Chelyabenergo.

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The annual savings from the introduction of the second phase of the Chelyabenergo automated control system amount to 3.546 million rubles; these savings are achieved basically by solving problems of optimizing the modes of the power system for active and reactive power and voltage levels, optimizing the planning of specific fuel consumption by power plants and reducing energy losses during selection of optimal section points in the circuit of the power system and calculation of optimal operating parameters of power equipment.

Automation of accounting and statistical tasks and the introduction of an operational-information automated dispatcher control complex helped to reduce the labor involved in gathering and processing production-management information, to increase the timeliness and quality of analysis of the energy production and distribution process, and to ease conditions for implementing power system control functions while holding down increases in the number of management personnel.

The automated document execution monitoring system has been improved and continues to operate.

The struggle to increase production efficiency, to utilize material resources rationally and economically, and to observe conservation conditions was developed further.

Execution of the measures planned during the All-Union Social Inspection of the efficiency of utilization of raw and other materials and fuel and energy resources during 1978-1980 resulted in savings of 71.8 million kWh of electricity, 3800 Gcal of heat, 64,082 tons of conventional fuel and 2106 cubic meters of wood.

A great deal has been done to fulfill social development plans and to improve working and living conditions of power system workers, as well as their time off.

Over 71,000 square meters of living space, 560 places in pre-school institutions, a 960-place school, a 120-bed treatment clinic and an 85-place rest facility were put into operation during the five-year plan.

The 11th five-year plan has placed large, complex tasks before the South Ural power workers, which we are obliged to resolve.

According to the five-year plan for the development of the Chelyabinsk power system for 1981-1985 developed in the light of the resolutions of the 26th CPSU Congress and encompassing all aspects of activity, we must make about 280 million rubles of capital investments which will be aimed toward building TETs-3 at Chelyabinsk, which is to be brought on line during the present five-year plan, water heating boilers with a total capacity of 960 Gcal per hour, a number of major 500-35 kV substations with total transformer capacity of 500,000 kV·A, and over 3300 kilometers of power transmission lines, of which over 70 percent are to serve the needs of agriculture. There are plans to build 64,000 square meters of living space, a sports complex and a pioneer camp.

The expected increase in power consumption in the system by the end of the 11th five-year plan will grow by more than 20 percent.

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Due to a number of objective reasons, and because of the lack of sufficient water resources, the Chelyabinsk power system cannot add power capacity by constructing new thermal power plants, and will have to compensate for the insufficient generating capacity by obtaining power from the USSR Unified Power System. This will force us to be involved even more deeply in questions of conserving electricity and fuel during the 11th five-year plan.

It is expected that over 300,000 tons of conventional fuel and 148 million kilowatt hours of electricity will be saved during the 11th five-year plan due to technical improvement of the production of electrical and heat energy at plants in the system, fulfillment of the integrated program for the introduction of energy conservation technology which has been planned for 1981-1985, and the application of secondary fuel-energy resources for rational utilization of fuel and electrical and heat energy by enterprises within the power system.

The following are the main directions of this program: optimization of the operating modes of turbine and boiler installations, reducing the amount of low efficiency equipment used, introduction of new and more efficient equipment in the local power plant circuits, improvement of the heat circuits at power plants based on new scientific development, and improving the efficiency of boilers and turbines by modernizing them.

Equipment operating at pressure of 90 kgs/cm² installed at the power plants of Chelyabenergo have already lived out their calculated service life (having operated for 200,000 hours): they have become obsolescent and physically worn out, so that their hours of operation must be curtailed as much as possible, and they must be replaced. By putting the 90 kgs/cm² turbines used for heat production during the winter into reserve for the summer, it is planned that about 35,000 tons of conventional fuel will be saved annually.

The replacement of obsolete and worn out 5Ts-10 supply pumps with PE-270-150 pumps will provide major savings. Unfortunately, all of our efforts to replace these pumps during the 10th five-year plan did not meet with success.

The coefficient of utilization of the steady state power of the 300 mW units at the Troitskaya GRES is high enough - 81-82 percent. It is not believed possible to increase this any further, and if we consider that these are early turbines, the only basic way to reduce specific fuel consumption is to modernize the equipment. Modernizing the turbines in the 300 mW units will make it possible to increase their economy by 1.5-2.5 percent; we are to receive help in this from Glavenergoremont and from the turbine manufacturer.

The coefficient of utilization of the steady-state power of the 500 mW units is 74-75 percent. Increasing this figure will depend upon eliminating a number of bottlenecks - improving the operation of electric filters, eliminating erosive wear of the coils in high-pressure boilers, preventing clogging of RVP [expansion not given] sections with caked ash and increasing the service life of induced-draft fans. For turbine generators, it is necessary to increase the service life of the rotor water line and to modernize the sealing of the stator end-box connector in order to reduce hydrogen leakage.

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The "Elektrotiyazhmash" plant at Khar'kov is not meeting its obligations to deliver equipment for rebuilding these units.

The boilers serving the 200-mW units at the Yuzhno-Ural'skaya GRES are unreliable. These are PK-33 ZIO head boilers which were installed at the plant in 1967. During their operating life, over 1000 emergency stoppages have been recorded. More than 10 million rubles have been spent to repair these units over the past 10 years. The ZIO must provide a cardinal solution to the problem of rebuilding or replacing them.

Improving the reliability and economy of the 200-mW units will provide annual savings of up to 20,000 tons of conventional fuel.

During the five-year plan, the production of heat throughout the power system is to increase by 14.6 percent, which will increase the proportion of electricity produced in the heat cycle. This also will provide a major reserve for reducing specific fuel consumption.

Like during the 10th five-year plan, the appropriate attention will be devoted to developing the system-formation network, primarily through the instruction of 220- and 500-kV power transmission lines. The supply networks for rural users will be primarily 110 kV, employing simple 110 kV substations. The length of rural distributing networks will be over 55,000 km by the end of the 11th five-year plan. The reliability of power supply to rural users will be improved by using the length of 6-10 kV outgoing distribution network lines, subdividing and sectioning lines, constructing 6-10 kV high voltage lines for cross-feeding, providing backup power for 35-110 kV substations and replacing overloaded transformers at 10-, 35- and 110-kV substations.

Work is to be completed during the 11th five-year plan on providing dispatcher centralization of 0.4-10 kV distribution networks, creating dispatcher points in each region of the electric networks and centralizing their service by outside operational crews and centralized repair crews.

Relay protection and automation facilities will continue to be improved during the 11th five-year plan. The total number of protective and automation sets will increase from 32 to 39-40,000.

In addition to the extensive use of solid-state relay protection and automation devices, there are plans to introduce new devices employing integrated microcircuits and microcomputers. There are plans for particularly intensive development of anti-emergency automation facilities which will make it possible to increase transfers of electricity over existing power transmission lines. A computer-based 500 kV centralized ring system in the Urals was put into operation in late 1981; automatic metering equipment was installed at the Troitskaya GRES, and there are plans to introduce the same automatic equipment at the Shagol PS [expansion not given]. Development has begun on problems of emergency automation equipment associated with the introduction of 1150 kV transmission.

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Work will continue during the 11th five-year plan to improve operational-dispatcher and organizational-economic management based on a multilevel organizational-technological automatic control system combining the functions of a process control system and a management information system.

Work will continue to develop a system for gathering, preparing and transmitting data; computer equipment will be replaced with more sophisticated systems.

In addition to such questions as improving operating reliability, which becomes particularly important in connection with the wearing out of some of the reserve equipment, major importance is given the prevention of environmental pollution. It is sufficient to say that there are plans to spend 45 million rubles on rebuilding technological power plant circuits in order to reduce environmental pollution, and to reduce the output of solid substances into the atmosphere by 2000 tons, and polluted runoff water by 170 million cubic meters during the five-year plan by introducing closed processing technical water supply systems.

During the 11th five-year plan, at least 85-90 percent of the increased national income will be achieved through improved labor productivity; therefore, problems of improving labor productivity are being given special attention within the power system.

We are to free 315 workers within the power plants and enterprises of Chelyabenergo-remont alone during the five-year plan, and this considers the addition of personnel to bring new capacities on line. Increased labor productivity is achieved by intensifying production, introducing an integrated program, reducing the amount of manual labor and introducing progressive forms of organization of labor. Chelyabenergo has developed an integrated program for reducing manual labor and labor under hazardous conditions for the 11th five-year plan.

A permanent central committee headed by the chief engineer of the power system has been established for methodological and organizational supervision of the development and monitoring of the integrated program for reducing manual labor.

As part of the work of the committee, 385 accounting cards for manual labor and labor under bad conditions encompassing 52.7 percent of all workers in the system were drawn up; all workers involved in manual labor were considered. In order to reduce manual labor, 592 measures have been planned, among which are 296 measures included in the integrated program for the 11th five-year plan. The execution of these measures should result in mechanizing the labor of 262 workers, freeing 280 workers and improving the working conditions of 907 workers.

The introduction of collective forms of organization and payment of labor serves as a powerful accelerating agent in the growth of the economy. The position put forth in the decree of the CC CPSU and USSR Council of Ministers "improving planning and strengthening action of management mechanism and increasing efficiency of work production" that the brigade form of labor organization and incentive shall become fundamental during the 11th five-year plan reflects the course of the Party toward strengthening the connection between payment for labor and the end result of production.

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Chelyabenergo began to work on introducing the contract brigade in 1978. The external-repair boiler shop of Chelyabenergomont initiated the introduction of the contract brigade, and used this method in 1978 to repair a number of important assemblies which were on the critical path of capital repair. A total of eight such brigades were organized. The labor savings amounted to 1570 man-days, with labor productivity of 125 percent.

In 1980, 61 brigades used the contract brigade method; the number of brigades in repair shops at power plants increased significantly. 14,254 man-days were saved, freeing an average of 33 workers and providing savings of over 80,000 rubles.

The system now contains 89 brigades made up of 682 workers, with 45 of the brigades using the piecework method, employing the labor participation coefficient. There are many difficulties involved in organizing and introducing brigade forms, and these difficulties are not becoming any fewer. It is necessary to improve planning and material-technical supply and technical support and to work on a large group of organizational matters.

One of the basic conditions for the successful introduction of the brigade form is detailed technically founded norming. A thorough check was made in October 1981 of the status of norming of labor at enterprises in the power system involving the participation of enterprise and structural subdivision supervisors, social organizations, production leaders, rate fixers, NOT [scientific organization of labor] workers and economists. There are now about 60,000 technically founded standards in force in the power system. The level of standardization of labor, defined by the labor consumed in completed projects, was 60 percent on the average for the power system, while the normative base in power engineering can standardize the labor of up to 80 percent of workers. The insufficient level of standardization of labor in the power system is explained by the low availability of the machines and mechanisms provided for in the branch standards. There is a severe shortage of rate fixers at power system enterprises. The system has no capability for increasing the rating staff, since these are AUP [expansion not given] individuals. This question must be resolved at the ministry level.

Like during the 10th five-year plan, a great deal of attention is being devoted to improving personnel work. There are plans during the 11th five-year plan to increase the qualification of 20,000 workers, 2700 engineering and technical workers and to train 810 new workers. The economic education network will train over 25,000 workers and laborers, over 5,000 mid-level supervisors and 300 top-level supervisors during the five-year plan.

In addition to plans for technical development and improving efficiency of energy production, a great deal of attention is devoted to social development plans of the power system enterprises for 1981-1985 aimed toward further development of production, better satisfaction of the material and spiritual requirements of the collective members, improving the working and living conditions and increasing the ideological-political and cultural-technical level of workers in all aspects.

The results of work done in 1981 indicate that a good start has been achieved. Fulfillment of the resolutions of the 26th CPSU Congress has become an internal

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need of the workers of our power system. The resolutions of the November (1981) Plenary Session of the CC CPSU have inspired them to extensive new work.

The plan for electricity production was fulfilled by 100.2 percent, and the heat production plan by 100.4 percent, in 1981. The profit plan was fulfilled by 102 percent, with profits of 2.2 million rubles above the planned figure reached. The savings from reducing the prime cost of marketable product amounted to 1.7 million rubles.

The plan to reduce the specific consumption of conventional fuel was fulfilled. The specific consumption per kilowatt hour was reduced by 1.4 g from the 1980 level, and by 0.1 kg per Gcal. The plan to reduce the specific amount of personnel per megawatt, comprising 1.4 workers, was fulfilled.

Fulfillment of the basic technical-economic indicators for 1981 inspires the certainty that the collectives of Chelyabenergo enterprises, actively engaging in Socialist competition to meet the 60th anniversary of the formation of the USSR in a fitting manner, will fulfill the plans for 1982 and the entire five-year plan with honor, thus making a worthy contribution to increasing the economic strength of our Motherland.

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